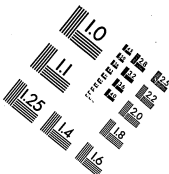
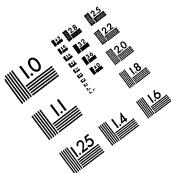




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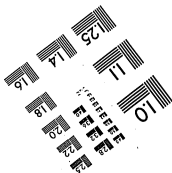
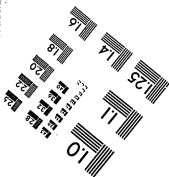
MS303-1980



Centimeter



Inches



# Thomas A Edison Papers

A SELECTIVE MICROFILM EDITION

PART II  
(1879-1886)

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Frederick, Maryland  
1987

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**Thomas A. Edison Papers**  
at  
**Rutgers, The State University**  
endorsed by  
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18 June 1981

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**START**

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THOMAS A. EDISON PAPERS  
A SELECTIVE MICROFILM EDITION  
PART II  
(1879-1886)

REEL 97

COMPANY RECORDS SERIES (COM-2)  
SUPPLEMENT TO PART I (ADD-1)

#### Edison Company for Isolated Lighting Bulletins

This bound volume contains eleven bulletins issued by the Edison Company for Isolated Lighting during the period May 1885-June 1886. These bulletins contain brief accounts of the activities of the various Edison electric light companies and of developments in the electric lighting field. Included are testimonials from Edison's customers, lists of isolated plants, and reprints of articles from newspapers and journals. There are also printed copies of letters by Edison, Francis R. Upton, and Edward Weston regarding comparative light bulb tests conducted by the Franklin Institute in Philadelphia, along with reports of the test results; letters by Upton and William E. Sawyer relating to electric light litigation between Edison and Sawyer; comparisons between the Edison system and competing gas and electric light systems; and descriptions of Edison's exhibits at electrical exhibitions in Paris (1881), Boston (1883), Cincinnati (1883), Louisville (1883), and New Orleans (1884). The spine is stamped "Edison Company Bulletins for Agents 1885-1886." Each bulletin is individually paginated. Bulletins 4, 5, and 13 are missing.

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NO. 1.

## BULLETIN FOR AGENTS.

THE EDISON COMPANY FOR ISOLATED LIGHTING.

65 FIFTH AVENUE.

NEW YORK, May 15, 1885.

DEAR SIR—In order to give our agents and our friends generally the benefit of as full and comprehensive knowledge of what is current in this office, as if they had daily access to it, we have decided to issue a weekly memorandum of information, together with such running comments as the various officials of the Company may think judicious to make and useful to agents. In accordance with this determination, we beg leave to submit the following items :

### PATENT LITIGATION.

The copy of one of our Bills of Complaint is sent simply that you may be able to answer authoritatively the question so frequently put, viz.: What is the Edison Company suing on? This is the chief case, but there are nineteen others almost equally fundamental in their character.

9719

The counter suits brought by the United States Electric Lighting Company against us are upon minor "Improvement Patents," none of which imperil in the slightest degree *our* enjoyment of the right to do incandescent electric lighting, whilst *our* patents, if sustained, involve heavy damages for past use, and prohibition of further use of the incandescent system by any and all others than the Edison Company and its licensees.

#### BRUSH VS. EDISON.

At the close of the Electrical Exhibition the Brush Company became very active in Philadelphia, and, by guaranteeing far beyond the Edison Company's figures, succeeded in selling two plants—one to Messrs. Folwell Bros., of 450 lamps, and one to the Fidelity Loan, Trust & Safe Deposit Company, of 50 lamps, guaranteeing in each instance ten lamps of 20-candle power each per H. P., and 1,000 hours' life. In neither case have they even approximated this figure. A test of Folwell Bros. plant showed eleven lamps of an average of less than 12-candles each. In consequence of this failure the plant has not yet been accepted, and will not be until the guarantee is made good. Several months of futile effort begins to make this apparent to Folwell Bros., who are now in negotiation with us to replace it with an Edison plant.

The Fidelity plant has proven so unsatisfactory that the Edison people have been given an order to show what they can do. They put in Edison lamps and a 75-light dynamo. The latest report of the running of which is herein given in an extract from Agent Hoskin, of Philadelphia, to Manager Hutchinsonson:

I am informed that Messrs. De Camp & Thibault of the Brush-Siemens Company, on knowing of the change of dynamo, called on a Mr. Jenkins who furnished the engine. On being told that the engine was running 220 revolutions, they remonstrated because it would drive the dynamo so fast as to burst the lamps. Jenkins said, "The lamps are doing better than before, not

bursting, and it is worth your while to go and see," which they accordingly did. Our Mr. Walker being in the engine-room at the time, said the look of consternation that spread over their faces, when, instead of their own, they saw an Edison dynamo at work, was worth seeing.

#### EDISON PLANT VS. UNITED STATES PLANT.

Aitken, Son & Co., dry goods merchants, Eighteenth street and Broadway, New York City, were using our dynamo and taking steam from boiler belonging to the estate owning the building they occupy. They were running the plant at the cost of paying an engineer, furnishing oil, waste and other incidentals, and very also paying the estate for the steam used. The agent of the estate, who is interested indirectly in the United States Company, offered to supply electric light to Aitken, Son & Co., for the same price as they were paying the estate for the power alone. Such an arrangement enabled Aitken, Son & Co. to get the United States Company's light at about one-third the cost to them of operating our plant. This offer, being such a favorable one, it was agreed to upon the condition that the United States light should be as efficient as the Edison. The following copy of a letter written by Messrs. Aitken, Son & Co. to an intending purchaser of an United States Electric Light Plant, speaks for itself:

MR. E. O. KELLOGG, Detroit, Mich.:

DEAR SIR—Yours of the 1st inst. to hand. The U. S. agent is entirely wrong in his representations of our opinion of the relative merits of the U. S. and Edison light. Instead of being willing to have "no offer" than the U. S. light we have about reached the point of having *no longer*. Our landlord has promised to restore our Edison plant in reply to our request unless the U. S. light is specially improved. The latter has never been up to the Edison in duration of lamps, brilliancy and steadiness of light.

# *In re* THE "ENGINE QUESTION:"

Excerpt from letter of Mr. Sims, of firm of Arrington & Sims, engine builders, Providence, R. I., to Mr. Vail, Superintendent, in regard to successful competition of their engine:

Our 14½ HP has been accepted by the Exposition (St. Louis). Our engine was in competition with Ibs, Hall, Westington, Commer and others."

## LOCKPORT GAS CO.'S ELECTRICAL WORK.

Some months since negotiations were opened up with certain citizens of Lockport with a view to introducing the Edison incandescent light in that city. These negotiations ultimately culminated in an arrangement with the Lockport Gas Company itself, the officers of which have proven, by their action in this matter, that they possess a keener foresight than any other gas company in the United States has yet shown. Our own belief is that the result of their action will be that other gas companies will follow suit. They first tried our light in a very "sluggish" sort of way, placing two 100 light dynamos in their gas works on trial, but, before these machines were actually installed, they discovered that the demand for the light so far exceeded their capacity that they must immediately enlarge, which they did by ordering two 200 light machines, and, ere these machines were well in operation, they found such an abnormal demand that negotiations were opened up with us for putting in a regular Edison central station of 1,000 light capacity. This work they are now engaged in laying out preparatory to having it in full operation the coming fall. This gas company, in addition to displaying a degree of enterprise superior to other gas companies, have actually distanced first to introduce the new Edison system of street lighting, namely, the Municipal System, and have found it to work so well that they are preparing for extensive enlargements. It is

the opinion of the officers of the Edison Company that this is one of the most important movements yet made in the interest of the electric light, inasmuch as if it shall be shown by this experiment that a gas company can introduce the electric light and gradually supplant its own gas plant with an electric installation, the entire gas capital of the country is available for investment in the electric light enterprise. The latest item from the Lockport Company is given in the following letter from L. Stirling, electrical expert:

F. S. HARTSON, Treasurer, 65 Fifth Avenue, N. Y.

Dear Sir—I am more than satisfied with all I saw in Lockport, N. Y. Our interview with these gas people was most pleasant and interesting. They intend to enlarge their electric light plant at once. I was shown Standard Station plans with a few changes for the increase, which means business. All the parties interested expressed themselves as satisfied. I find a very good installation, all consumers happy, and a demand for more light. The station is running with a full load on. To me, the Municipal System proves to be the biggest find—it is a nugget. These gas people fully endorse this system by adopting and approving it.

## COMPETITIVE ELECTRIC LIGHT TESTS.

The "Philadelphia Call" prints the following relative to electric light test, now going on in Franklin Institute, Philadelphia, Pa.:

At midnight last night (May 6th) the 600 hour test of the different systems of electric lights at the buildings used by the Electrical Exhibition was completed. The test will be continued for 1,000 hours altogether.

The different lamp centers were all guaranteed for 600 hours, and, although the official report will not be made till the expiration of the 1,000 hours, it is known that of the 20 lamps submitted by the United States Company, 12 have gone out. The Stanley Company has lost 16 out of their 20. The Woodhouse & Rowson Company have lost 9 out of their 10, and the Edison Company one out of their 20. All have lost some candle-power; some more than others, but no accurate statement on this point could be had. As to the efficiency, that is, the current necessary to send through each lamp, it was found that the Weston Company's lights required 3.6 Watts per candle; the Edison, 4.4; the Stanley 4, and Woodhouse & Rowson 2.8.

The committee that superintends the tests of the lights is composed of Professor Marks of the University of Pennsylvania; Lieutenant Murdoch U. S. N.; Dr. Went, of the Philadelphia Gas Works, and Lieutenant Duncan U. S. N. In two weeks time the tests of the dynamos will commence, under the supervision of Commander Jewell, U. S. N.; Lieutenant Anderson U. S. A.; Lieutenant Murdoch and Professor Marks. Only six dynamos are now in the building for testing—three of the Edison and three of the Weston pattern—but more are expected. The tests will not be finished before the middle of June."

#### REPLY TO CLAIM OF CONSOLIDATED ELECTRIC LIGHT CO.

A statement having recently appeared in the papers to the effect that a patent had been granted to Sawyer-Man of such fundamental character as to make it controlling of the incandescent lamp, a brief explanation is deemed to be necessary in order that agents may be able to answer queries put to them. The matter is not of great importance, and it is only necessary to remark that the statement made upon the authority of the Consolidated Electric Light Company (Sawyer & Man) that in consequence of the issue of certain patent office litigation the award of priority of invention of the incandescent lamp is given to them in the patent now just issued, is without foundation in fact. The litigation in question was confined simply to the use of a certain material, viz.: Paper, the use of which material has long since been abandoned by all makers of incandescent lamps (inclusive of the Sawyer & Man people) excepting only the U. S. Electric Light Co.

Mr. Edison's invention consists in the discovery of a practical method of subdividing the electric current and producing light by incandescence, which method is clearly expressed in the patent granted to him, No. 223,898, dated January 27th, 1880, in the words of the *first* claim, as follows:

An Electric Lamp for giving light by incandescence, consisting of a filament of carbon of high resistance made as described and secured to metallic wires as set forth.

This was an absolutely new departure in the art, is fundamental in its character, and remains to-day the sole and only means by which practical incandescent electric lighting can be done.

It is upon this fundamental patent that the Edison Company has lately brought suit against all Electric Light Companies making and selling the incandescent lamp.

NOTE.—You may add to the value and interest of this weekly memorandum by sending to us promptly any information which may come to your hands of interest to your fellows in the business.

Truly yours,

EDWARD H. JOHNSON,  
President.

No. 2.

# BULLETIN FOR AGENTS.

THE EDISON COMPANY FOR ISOLATED LIGHTING.

65 FIFTH AVENUE.

New York, May 28th, 1885.

## CONTRACTS CLOSED.

Since the 1st of April we have contracted for twenty-six installations, which will add 6,970 lamps to our already extensive list of isolated plants. The contracts closed are as follows:

By	Purchaser.	No. Lamps.
Benton, C. A.	Aster Estate, N. Y. City	1,028
" " "	Howland & Co. Sandy Hill, N. Y.	150
" " "	Hotel Belmont, Mt. Kedge, N. Y.	200
" " "	Springfield Hall, Philadelphia, Pa.	700
" " "	Village of Little Falls, N. Y.	500
" " "	Banquet Hall, N. Y. City	250
" " "	Prison Building, N. Y. City	200
Card, B. P.	J. S. Mills, 411 Broadway, N. Y. City	50
Clark, H. A.	Overland Road, Homestead, N. J. (10 C. P.)	600
" " "	C. A. Goodell Mfg. Co., Baltimore, Md.	72
" " "	Seaman & Louie, Baltimore, Md.	41
" " "	Robert Bennett, Baltimore, Md.	800
Hix, W. P.	Camp Spring Milling Co., St. Louis, Mo.	21
" " "	Southern Power Mill, St. Louis, Mo.	25
" " "	University of Missouri, Columbia, Mo.	350
" " "	Deaf and Dumb Institution, Fulton, Mo.	916
	Carried forward	4,988

By	Purchaser.	No. Lights.
	Brought forward.....	4,983
Hughes, C. T. ....	N. Y. World, N. Y. City.....	459
" " " " " "	The Courier Co., Buffalo, N. Y. (10 C. P.).....	120
" " " " " "	Polar Oil Company, Syracuse, N. Y. ....	85
Merkle, J. R. ....	Detroit Post & Tribune, Detroit, Mich. ....	60
" " " " " "	Detroit Free Press, Detroit, Mich. ....	100
" " " " " "	The steamer "Mascotte," Detroit Dry Dock Co., Detroit, Mich. ....	50
" " " " " "	Jackson Light & Power Co., Jackson, Mich. ....	500
Palme & Stehney ..	R. J. Simonds, Woburn, Mass. ....	400
" " " " " "	Gilbert Mfg. Co., Ware, Mass. ....	181
" " " " " "	Adams Express Co., Boston, Mass. ....	50
	Total.....	6,970

During the same period last year the total number of lamps contracted for were 1,267. There are numerous very large installations in view, and it is possible that we will sustain this volume of business for some weeks to come.

#### ELECTRICAL DIRECTORY.

A very interesting publication has been issued by the Star Tower Company, of Fort Wayne, Ind., called the "American Electrical Directory." It contains miscellaneous electrical information, and, among other things, a list of all the incandescent light plants throughout the United States and Canada. A copy of this has been ordered to be sent to each one of our agents, and they will be gratified to see that their efforts have been so liberally rewarded, and that any incandescent plant other than the "Edison" is almost a novelty. This information was compiled by the Star Tower Company through direct correspondence with the companies themselves as to what work they had done, so that there can be no doubt but that the list is full and complete. The book should prove a valuable aid to our agents in their negotiations, and must carry with it a conviction that whatever the claims of the

other companies may be, the discriminating public prefer the Edison system.

The American Electrical Directory lists the various isolated electric light plants as follows:

#### Incandescent.

Swan.....	1
United States.....	80
Edison .....	308

#### Arc.

Brush.....	174
Janney.....	29
Thomson-Houston.....	14
United States.....	112
Van Dusen.....	29
Fuller.....	29
Exorbler.....	24
Thomson-Houston & Fuller.....	1
Western Electric.....	1
Lowell Muller.....	1
Helsler.....	6
Brunsdorf.....	3
Total.....	513

#### LOCKPORT CO. REPORTS PROGRESS.

Mr. T. T. Flagler, President of the Lockport Gas Co., Lockport, N. Y., has sent Mr. Vail the following letter in reference to increase of their Central Station Plant in Lockport. This is the best evidence of what a gas light company thinks of the "Edison Light."

LOCKPORT, N. Y., May 16th, 1885.

J. H. Van, Esq., Supt. Edison Company, 65 Fifth Avenue, New York:

Dear Sir—Yours of May 14th received. We are engaged at present in building a stone building 38 ft. by 65 ft. 6 in., in which we propose to locate three steel boilers 5 feet 6 in. diameter and 16 ft. long. The balance of the room to be left for location of the engines, dynamos, &c.

We can testify that many of the promises, undertakings and representations of your Company to us have been fulfilled.



The Edison Light has become very popular among our citizens, and has been taken now to the full extent of our plant. *We regret that we did not see the start just as large as we would have been saved a considerable expense and some annoyance.* The demand for the light is not as active as it has been owing to the long days. We expect, however, that when the days begin to shorten we will be called upon to wire a great many places of business.

Yours truly,  
(Signed)

T. T. FLAGLER, President.  
Lockport Gas Company.

#### CIRCULAR TO THE GENERAL PUBLIC.

The Edison Electric Light Company hereby gives notice to the public, as follows:

- 1st. That the patents of Mr. Thomas A. Edison, use the property of this Company, fully cover the exclusive manufacture, sale and use of any and all practical incandescent lamps.
- 2d. That the Edison Company having begun suits at law for the enforcement of its rights under these patents, will not relax in their vigorous prosecution.
- 3d. That the Edison Company is prepared to fully guarantee and protect all its customers and to prosecute and punish to the full extent of the law, all makers, sellers or users of incandescent lamps not duly authorized by it.

The late attempt to establish for the Sawyer-Man patent, just issued, a fundamental character, is made upon wholly superficial ground, and will not bear the test of close analytical examination. Edison's patent of January, 1880, applied for at the time of his great discovery, covers broadly all the elements of that discovery, and is therefore *fundamental* and *controlling*. The Sawyer-Man patent, constructed in the light of the knowledge of 1880, but having for its foundation unsuccessful laboratory experiments, only covers certain detail of manufacture of carbons, as, for instance, paper and the specific *genre* of material to which it belongs, and is therefore *secondary* and *subordinate*. The claim that the Sawyer-Man patent is fundamental, simply because the narrow and valueless claim to the use of paper has been illegitimately, and without notice to Edison, broadened to a claim for all fibrous material, carries its own condemnation. If anything more is necessary to demolish it, it may be stated that Edison, Swan and others have

already used material absolutely non-fibrous in preference to a material the claim for which is now held to control the construction of a practical lamp. The public have nothing to fear from the use of the lamp as supplied by the original inventor and discoverer, whilst they render themselves liable for damages by the use of his fundamental patent for a "Filament of Carbon," if unauthorized by the Edison Company.

THE EDISON ELECTRIC LIGHT COMPANY,

By

EDWARD H. JOHNSON,  
Vice-President.

May 23d, 1885.

#### CIRCULAR OF EDISON ELECTRIC LIGHT COMPANY OF YORK, PENN.

Immediately after the granting of the recent patent to the Consolidated Company, the town of York, Pa., was selected by them for the purpose of making an attempt to frighten off the subscribers to a local Edison company which had been formed in that town. The installation of the plant had been commenced, when the agents of the Consolidated Company appeared on the ground, and, by inserting inflammatory articles in the local papers and making extravagant statements to the subscribers, a question was mutually raised by our local company as to whether there might be any truth in the reports circulated by those men. They therefore sent their attorneys to Washington for the purpose of making an investigation, and the letter which we give below is the result:

#### To the Public.

The Edison Electric Light.

The recent statement made by self-interested parties in the *DAILY* that a "recent decision by the Commissioner of Patents in the case of Sawyer & Man vs. Edison gives priority of patent to the Sawyer & Man lamps," is misleading, and should not pass without a proper explanation and contradiction.

After a careful investigation we are prepared to say, without fear of successful contradiction, that no such decision as above indicated was at any time made by either the Commissioner of Patents or a judicial tribunal. The decision on which the allegations of the opponents of Edison is based, and which forms the subject of misrepresentation, is in all probability that made

by the Commissioner of Patents as far back as 1883, not recently, which arose on a contest confined entirely to the right to use a certain material, namely, paper, which was decided in favor of Sawyer & Man.

The decision is of no importance to-day, since no electric light company now make use of paper, it having been abandoned for use even by those to whose priority of patent was awarded. This decision did not in any way affect the incandescence lamp, as will be fully made to appear by reference to it. No more recent decision than this exists on any contest against Edison in the use of his patents for electric lighting, unless, indeed, it be those of the courts of Germany, where the Edison patents, now in practical use in this country, after the most thorough investigation, were fully sustained.

Mr. Edison's patents could in a practical method of subdividing the electrical current and producing light by incandescence and the use of a filament (or thread) of carbon of high resistance, and these patents are fundamental, and have up to this time not been successfully contested in this country.

The object of the free use and misrepresentation of an obsolete decision, of no present practical value to any electric light company, and parading the same falsely as of recent date, is too transparent to admit of further notice.

GESSE, ZIEGLER & STRAWBRIDGE,

Attorneys for Edison Electric Light Co.

Yonk, May 22, 1885.

#### To the Public,

The Edison Electric Light Company of York, announces that they are making rapid progress toward the completion of their plant. A brick building, to contain their machinery, will be finished next week. Everything has been contracted for, two engines of eighty horse-power each will be on their foundations in three weeks, and new pattern dynamos from the Edison Machine Works will be placed in position by the same time. The poles are nearly all erected. The station at Harborside is very encouraging to the promoters.

Every patron of the light will be amply secured in its use against any outside interference, as Mr. Edison holds the exclusive right to all the lamps and appliances that will be used by the Edison Electric Light Company of York. All applications for light should at once be made to Adam P. Gessy, or to the undersigned, as all wiring up to the time of the starting of the light will be done at the expense of the company.

G. P. YOST,

President.

J. WILST,

Secretary.

#### WESTERN CRITICISM ON THE UNITED STATES CO. LIGHT.

In order to illustrate the methods employed by some of our would-be competitors, we publish, by permission, correspondence between the Chicago agent of the United States Company and the representative of the Board of Trade. The contract for lighting the Board of Trade Building was awarded to the Western Edison Company after competitive bids had been received (in which we were unaided), and after a thorough examination of both systems the contract was, as above stated, awarded to us. This correspondence took place after we had actually commenced the work on the Board of Trade Building, and with the foregoing explanation the letters will speak for themselves, and will need no further comment from us.

THE UNITED STATES ELECTRIC LIGHTING CO.,

195 LA SALLE STREET,

CHICAGO, Ill., Mar. 25, 1885.

MESSES. BENTLEY, IRWIN & COFFMAN, Members of Committee to purchase

Electric Lighting Apparatus for the Board of Trade Building:

GENTLEMEN—I am just informed that you have awarded the contract for lighting your building with incandescence lights to the Western Edison Company. Not wishing to in any manner criticize your judgment, I cannot help thinking that you have misunderstood the details of their bid, as compared with ours.

These people being merchants in electric lighting apparatus, that is: having to buy from the manufacturers at our price, and selling at a profit, cannot possibly compete in price with us, representing as we do the factory where such apparatus is produced, except they choose to submit to a loss, which in your case must be if they have unaided us, or put up inferior work, as our price all through was based on about actual cost of erection.

But setting this all aside, and assuming that their bid was slightly under ours, have you fully considered the question of difference in results obtained in the two systems? The item of steam supply to drive engines furnishing power to the dynamos, is after all the most important one to be considered, and next to it is the matter of regulation, involving as it does, the breakage of lamps. We actually guarantee you ten lamps for every horse-power employed in driving the dynamo, as against the very best the Edison people can do, namely: between six and seven. In the daily running expenses, which

go of course just as long as your plant runs, you get about one-half more light from the same coal; or in other words, you get 66 units of light in the Edison, as against 100 in ours. Our machines being absolutely automatic in their action, requiring no regulating device (which are, to say the very least, quite imperfect), reduces the lamp breakage to a minimum.

I have no doubt that in a contest with the successful bidders you will protect yourselves so that at some future time you will be enabled to denunciate the points to which I call your attention, and will perhaps be even interested to know positively the actual difference in results to which I have now directed your attention.

Feeling very keenly that there must have been some misapprehension concerning the nature of the proposal or class of work to be done, I make this my only apology for writing you.

Since writing the above my attention has been called to the crude manner that the Edison people are doing their work in the Councilman Building. If such work is what would be satisfied with as regards the wiring, I can only say that I could have made my estimate on the wiring almost one-half of what I did; but believing that the very character of your building required such work as we are putting into buildings of similar character, such as the Royal Insurance, the Home Insurance, Muller's Building, and as has been done in the Post Office, etc., etc., I made my proposal for such work.

I confess to the most unbounded surprise at the character of the work now being put into the building above mentioned by the Edison Company, and can only say that I would not permit it even in an ordinary factory building, under the present state of the art, and furthermore I am perfectly assured that the City Inspectors of electric wires should permit such work as is being done at the present time in the Councilman Building.

I confess that I feel the defeat keenly, when considering how I was defeated.

I desire to be judged properly by your people, and wish the judgment formed upon the character of my work, and the result of our experiment.

Asking indulgence for trespassing upon your valuable time, I am,

Very respectfully,

(Signed)

C. C. WARREN.

Manager Western Department,  
The United States Electric Lighting Company.

CHARLES COUNSELMAN & CO.,

CONSUMERS' MEMORANDUM.

CHICAGO, March 25th, 1885.

C. C. WARREN, Manager United States Electric Lighting Co., City:

Your communication of the 25th is before me, as are those of the managers of the Board of Trade. I answer you, however, in my individual capacity; and to your labored effort made up of unsupported and interested statements, I have to reply that the work being done in the Councilman Building is satisfactory to Mr. Counsellman; and your criticism suggested by the chagrin of defeat in your proposition is as gratuitous as it is insulting, and can only be tolerated upon ground of bad manners and such ignorance.

I saw your light burning and would not have it as a gift, and I think our committee are quite able to transact their business without your assistance; and you have the distinguished and veritable position of lying about your competitors when they are not present to defend themselves.

Yours truly,

(Signed) CHAS. COUNSELMAN

CHICAGO, March 25th, 1885.

MR. C. C. WARREN:

I saw your light—after that I got the Edison light and then after comparing lights I concluded I would not have yours.

Action of our Committee was unanimous. I see you have no apology. Certainly do not expect an apology from a man capable of besmearing the good name of a competitor who competed fairly and has not in any way instance spoke disparagingly of your company. I am a special advocate always of fair play. Jealousy is always the distinguishing mark of an uneducated brain; it also suggests cowardly attack when its hopes cannot be realized.

Yours very truly,

(Signed) CHAS. COUNSELMAN.

BY THE AUTHORITY OF THE CITY OF CHICAGO. ELECTRICAL  
INSPECTION CERTIFICATE.

No. 84.

OFFICE OF CHICAGO,  
State of Illinois, } ss.

April 6th, 1885.

This certifies that the undersigned, Superintendent of City Telegraph for the City of Chicago, has inspected the electrical wires at the N. W. corner

of La Salle and Jackson streets, used for illuminating purposes, whereof the Connecticut Building is the most. And having performed that service, now, on this sixth day of April, 1885, does further certify, that the said wires and attachments are properly arranged and insulated, as contemplated in and by the ordinances of the City of Chicago, and that they are now in proper condition to be used for purposes of illumination.

JOHN P. HARRITT,  
Superintendent of City Telegraph.

#### Final Result of the Lamp Test at Franklin Institute, Phila., Pa.

In the lamp test now ended at Philadelphia, 20 lamps each, of the following styles, namely, the Edison, the United States Co. (Weston), the Westinghouse (Stanley), and 11 of the Woodhouse & Rawson Co.'s were placed in separate boxes, and resistances so arranged that each lamp could be burned at normal candle power. The intention was to test the lamps until one style showed "decided superiority" as over the other, replacing broken lamps by others. The first four lamps of the United States Co. (Weston), one lamp of the Edison Company and two lamps of the Westinghouse Co. (Stanley) were thus replaced, giving a trial for life upon more than 20 lamps of each of these competitors. The Committee having the Test in charge finding that all lamps but the Edison were giving out so rapidly concluded that it was not worth while to substitute new lamps for those broken. This makes the final result after 1,065 hours continual testing as follows:

Edison lamps, broken.....	1 out of 21
Weston lamps, broken.....	17 " 24
Stanley lamps, broken.....	19 " 22
Woodhouse & Rawson lamps, broken.....	All " 11

At the end of 500 hours testing the Committee were unanimously of the opinion that the Edison Co. had won and that there was no need of carrying on the test further. The Edison Company were desirous that a record of at least 1,000 hours

burning should be obtained from the Edison lamps. The committee assented on condition that the other lamps should be tested. Thus with lamps which had burned over 500 hours the Edison Company were willing to race with lamps fresh from the makers. The result of this second competition is as follows:

Edison Co., entering the Edison lamp, lost one lamp out of 21 in 1,065 hours.

United States Co., entering Weston's 70 volt paper lamp, lost 3 out of 10 in 524 hours.

W. H. Proce, F. R. S., entering the Woodhouse & Rawson lamp, lost 6 out of 10 in 332 hours.

Unknown parties entering the "Sun" lamp, lost 3 out of 10 in 308 hours.

#### INCREASE OF PLANT IN PHILADELPHIA LEDGER

The Philadelphia Ledger people have arranged to supply current for lighting the elegant new banking house of Messrs. A. J. Drexel & Co., on Chestnut street. The banking house has been wired for about 200-16 C. P. lamps, and the current is conducted through 750 feet of Edison underground electric tubing, which is laid in Chestnut street. The Ledger people have changed their "K" dynamo, which has been in use for the past three years, for one of our new "Y" dynamos, which will enable them to run 30-16 C. P. lamps.

#### INCREASE OF THE EDISON SYSTEM AT MIDVALE STEEL WORKS.

The Midvale Steel Company, at Nicotown, Pennsylvania, are supplied with a 100-light Edison dynamo, which has been in

use for the past year for lighting their offices and counting-rooms. They have made some experiments in the arrangement of lights for lighting their machine shop; these experiments have proved to be so entirely successful that they have recently fitted up their machine shops with a system of combination swing brackets and pendant lamps, whereby they can use the light with great satisfaction around the large planers, lathes, drill presses and boring machines. The swing brackets are made of light but strong wood, and the current is conducted to them through rubber-covered pliable cord. A counterbalancing weight enables the light to be hoisted up to the ceiling when not in use. The lights are in use in the machine shop when the capacity of the dynamo is not required for office lighting.

The Western Edison Light Co. have installed a plant in the Plankinton House, Milwaukee, Wis., and the Proprietor of the Hotel writes the following letter of satisfaction to the Western Edison Co.:

(Copy.)

MILWAUKEE, WIS.  
Office of the Plankinton House.

WESTERN EDISON LIGHT CO., Chicago, Ill.:

GENTLEMEN—In reply to yours of the 21st will state that the Edison Electric Light Plant installed by you in this house has been in operation for over a year, and has in every way given me entire satisfaction.

It is all you have claimed for it in every respect, easily managed and operated by the servants about the house. It is run from the engine which had run the arc lights, and is perfectly steady. I am pleased with it beyond expression, and do not see how it could be improved on.

Yours truly,  
(Signed) JOHN PLANKINTON.

We have installed a plant in the building of the Detroit "Free Press," at Detroit, Mich. Mr. Marble, our agent in Detroit, writes the following, under date of May 23d, to Mr. Hutchinson, Manager, in regard to the success of the plant:

Started the "Free Press" plant up last evening and it ran O. K. from the start and gives unbounded satisfaction.

The contract with United States Lights is marked, and to-day the manager requests me to have our lights put in his private office and the United States' removed.

#### ARC AND INCANDESCENT LIGHTS ON SAME CIRCUIT FROM EDISON DYNAMOS.

Our agents are often asked if we can furnish such an outfit; we answer, "Yes, to a limited extent." We have them in use on the Str. *Mississippi*, of the United States Engineer Corps, Mississippi River Commission. On this boat we are operating a focusing lamp for a head light, and a hanging lamp for deck, or dock lighting when landing. They have been reported as operating perfectly.

We feel safe in placing arc lamps on our circuits from incandescent dynamos, as follows:

On dynamos types No. 3 and No. 4, two arc and 40 and 65 incandescent lamps respectively.

On dynamos types No. 6 and No. 8, four arc lamps and 80 and 130 incandescent lamps respectively.

Other types of dynamos in same proportion.

Extra cost is about as follows:

Focusing arc lamp, reflector, elevating apparatus, resistance, &c., exclusive of wiring, \$225 each.

Hanging arc lamp, resistance, &c., exclusive of wiring, \$95 each.

## JUDICIOUS ADVERTISING.

We submit the following as an effective style of advertising and one which will commend itself to the general public.

# EDISON

## ELECTRIC LIGHT.

J. B. MARKLE, MANAGER MICHIGAN DEPARTMENT, 183 ORCHWOLD ST., DETROIT.

The British Admiralty have made exhaustive tests relative to cost of oil and Electric Lighting on board the man-of-war "Colossus" at Portsmouth. The coal and oil used in the trial were carefully measured and valued, and as compared with the cost of lighting it was found that electric lighting is the cheaper by at least one-half.

The Michigan School for the Blind, at Lansing, Mich., find the cost of operating an average of 88 Sixteen Candle Power Edison Lights, 5 1/2 hours per day, to be 24 1/4 cents.

Cost of running 98 Lamps, for one hour, exclusive of interest, 10c. Cost of running 98 Lamps, for one hour, including interest, 10 1/2c.

The Ypsilanti Paper Co., Ypsilanti, Mich., find the cost of operating 87 Edison lights, by water power, all night each week day for one year, to be \$41. Average life of lamps, 1,600 hours.

The Electric Lamp tests now going on in Franklin Institute, Philadelphia, Pa., show the following results, after the 900 hour test of the different systems:

Of the twenty lamps submitted by the United States Co., twelve have gone out. The Stanley Co. have lost sixteen out of their twenty. The Womhouse & Hawson have lost nine out of their ten, and the Edison Co. one out of their twenty. The committee that superintends the tests is composed of Prof. Mark, of the University of Pennsylvania; Lieut. Murdock, U. S. N.; Dr. Ward, of the Philadelphia Gas Works, and Lieut. Duncan, U. S. N.

E. H. JOHNSON,

*President.*

No. 3.

## BULLETIN FOR AGENTS.

THE EDISON COMPANY FOR ISOLATED LIGHTING.  
65 FIFTH AVENUE.

New York, June 6th, 1885.

### THE CINCINNATI "ENQUIRER" ON THE EDISON LIGHT.

"The Enquirer," Cincinnati, Ohio, in an editorial in its issue of May 30th, 1885, referring to a fire which had occurred in the printing establishment of Sullivan & Co., No. 19 West Sixth street, Cincinnati, Ohio, wherein 15 lives were lost, gives the following practical advice:

#### THE SIXTH STREET HORROR.

And How it Might Have Been Averted.

A Valuable Bit of Information and Lesson may be Learned by Manufacturers and Printers who Find it Necessary to Use Gas or Artificial Light in their Establishments.

In the late fire on Sixth street, in which so many people lost their lives, the origin is traced down and fixed by the Coroner's verdict to the breaking of a jar of benzine and the vapor from the same coming in contact with a gas jet.

If manufacturers will investigate the Edison Incandescent Light, which is coming largely into use throughout the country, they will find that such an occurrence would not have happened if that light had been used. If the jar of benzine had been broken under an Edison Incandescent Lamp there would not have been the least danger of fire. The same holds good precisely in reference to the fire in the same block scarcely a year ago, in which nine persons lost their lives through a bunch of rags being set on fire by coming in contact with a gas jet. If the correct statistics could be obtained it would in all probability be found that a large percentage of the fires in manufacturing establishments are the result of similar contact of accidents in connection with the gas light; hence the subject of using the Edison Incandescent Light should receive the prompt and serious consideration of all manufacturing and business interests that find it necessary to use artificial light in connection with their business, and especially when a large amount of help is employed. The introduction of the Edison Incandescent Light into the commercial world though of recent date, is rapidly making itself felt, especially among those who engage in the use or manufacture of combustible material, on the grounds of its absolute safety under any and all conditions. These reasons, together with the important facts that it is a much better illuminant than gas, much steadier, cleaner and more comfortable on account of the absence of heat, with the still more important fact that gas, especially in large consumers of light it is far more economical than gas, ought certainly secure it the earnest consideration of all parties desiring a safe, clean, brilliant and economical light, with the danger of fire by accidental contact with it reduced to such a small minimum that it may almost be safely said that it is impossible to obtain fire from the system.

#### THE LATE COMPETITIVE LAMP TEST AT THE FRANKLIN INSTITUTE, PHILA., PA.

The Philadelphia "Evening Bulletin" of May 28, 1885, contains the following editorial relative to the superiority of the Edison Incandescent Lamp over that of all other makers:

The Edison Company seems to have beaten its competitors out of sight with its electric lamps. The Franklin Institute test has undoubtedly been fair and thorough, and the Edison people prove their superiority beyond all question. They use pure bamboo carbon, while others use lamboos.

#### INCANDESCENT VERSUS ARC LIGHTS.

The following extracts are taken from the "Detroit Free Press" of May 24, 1885:

When, nearly one year ago, "The Free Press" removed to its new and far more commodious quarters, on the corner of Larned and Shelby streets, it left behind its gas fixtures and German student lamps and adopted electric lighting entirely. Two dynamos were placed in the engine room, and the basement and five floors lighted thereby. In the press rooms and other mechanical departments were placed arc lights of 2,000 candle power; in the office, editorial and composing rooms incandescent lights of the nominal power of twenty candles.

"The Free Press" has not flattered to bestow upon any man's patents, but its employees desire to go upon record as saying that incandescence is the perfect light for night workers. Being absolutely devoid of that and never flickering or changing in its volume, the eye does not tire even with long hours of uninterrupted writing by its light. Not so the arc light, however. That has been too intense and unsteady, and has recently been supplanted by the Edison incandescent. Even the gas jet in the elevator, the only one in the building, has given place to a pen-chapel bulb, supplied by a flexible wire that coils and uncoils as the elevator ascends and descends.

The general public cannot realize the boon that incandescent lights are to the employees in workshops. In the new composing room of the "Free Press" last night fifty-five men were working by the light of ninety-nine bulbs. The air was cool and healthful, and the men worked in comparative comfort. Had there been ninety-nine gas jets burning in the room the heat would have been intense and the atmosphere stifling, because of an insufficient supply of oxygen. It would also be heavy with unconsumed carbon. With the incandescent light there is no heat, no carbon, no combustion.

Hundreds of citizens have recently inspected the lights in this building, and all have pronounced it a complete success. They have inspected it with a view to adopting the system in their places of business. They have also asked the question:

"What is the cost as compared with gas?"

The question has not been answered, but shall be now. It is not claimed for the figures given below that they are absolutely correct, but they are very nearly so, and in their compilation all doubts have been awarded to gas, and not one in favor of electricity.

There are in the building 225 lights, and the average time each is used has

been carefully noted. The total is 1,318 hours for one lamp for each working day. This multiplied by 312, the number of working days in a year, gives 411,216 hours. A portion are used on Sunday nights, the total for fifty-two Sundays being 29,200 hours, a grand total of 438,152 per year. There are times when no machinery is running except the dynamo, and the engineer has carefully noted the consumption of coal per hour at such periods. Upon this basis he reports the fuel expense at \$248.50, and this is the only expense excepting the bulbs, or lamps as they are commonly called. These cost \$1 each, and are warranted to burn 600 hours. Experience shows that they exceed this somewhat. During the year 700 of these have been purchased. Total expense, \$918.00.

If instead of a bulb it be a gas jet that is burned 438,152 hours, burning four feet per hour (and four-foot burners generally burn five or six feet per hour) the consumption of gas would be 1,752,000 feet per year. This at \$1.50, the lowest price per 1,000 feet charged here, would cost, rejecting cents \$2,628. At 62 per 1,000 feet the cost would be over \$4,500.

#### THE LIGHTING OF LARGE AREAS, EXPOSITION BUILDINGS, ETC., BY THE EDISON INCANDESCENT SYSTEM.

It was claimed that the Edison System was so comprehensive and so flexible that it was capable of a practically indefinite expansion without becoming unworkable. This claim was disputed by other workers who maintained that the incandescent method was only capable of a limited expansion. In order to establish their claim the Edison people determined upon making a few large exhibitions on their own account with the expectation that these would be followed by regular undertakings in the same line for the purpose of lighting exhibitions as a matter of commercial business.

Mr. Stieringer's facts and figures speak volumes in support of the legitimate character of this branch of the Edison work, and their importance is still further emphasized by the fact that no other electric light company in the world has as yet even essayed the work of installing such large plants, and distrib-

uting over such large areas, not to speak of the minor details of regulation, uniform candle-power, mean effective illumination per candle, etc, etc.

The following are Mr. Stieringer's figures:

Paris Electrical Exposition, 1881.....	1,200 lamps.
Crystal Palace Electrical Exposition, London, 1882.....	1,000 "
Manufacturers' & Mechanics' Institute, Boston, 1882.....	750 "
" " " " 1883.....	900 "
Cincinnati Exposition, Cincinnati, O., 1883.....	600 "
Chicago Exposition, Chicago, Ill., 1873.....	750 "
Manufacturers' & Mechanics' Institute, Boston, 1883.....	800 "
Southern Exposition, Louisville, Ky., 1883.....	4,000 "
Southern Exposition, Louisville, Ky., 1884.....	5,000 "
Philadelphia Electrical Exhibition, Philadelphia, 1884.....	3,000 "
St. Louis Exposition, St. Louis, Mo., 1884.....	3,000 "
World Exposition, New Orleans, 1884, 1885.....	6,000 "

With the exception of the Electrical Exhibition, and one or two of the minor exhibitions, this lighting was a matter of contract with the exposition authorities, and the Edison Company realized a profit from each and all of such contracts.

Some facts of interest are appended in relation to the cost and the amount of effective illumination obtained from the Incandescent lamp per candle as compared with gas and the Arc light.

In Paris the Edison light attracted great attention, and received ecologicist comment from every source, because of its staidness, purity and softness, and the Edison system in its entirety commanded the unqualified praise and first premium for its completeness. In London the Edison exhibit was the acknowledged centre of attraction, because of the "happy effects and results obtained" by the judicious disposition of the lights.

In Boston the light achieved a triumph over its electric rival, the Arc, in completely eclipsing the latter in the work of



lighting the picture galleries, thus causing the entire abandonment of the Arc, and the substitution of the Edison Incandescent, producing a character of picture gallery lighting never before obtained by artificial light.

In Louisville, Ky., 1883, the assertion was freely made by gas men, compelling electric concerns, and other interested parties, that we would "fail miserably" in the work. Some asserted that it would take "a million lamps." The area lighted by us was about 700,000 square feet, and comprehended all departments of the great exposition, Main Exhibit Hall Machinery, Art Gallery, Music Hall, etc., etc. Most of this space was lighted effectively by one 16-candle lamp per 175 square feet, and none less than 60 square feet per lamp. That it was effectively and satisfactorily done may be inferred from the fact that the contract was again awarded to us in 1884.

In this year the gas company bid for the work, but their bid of \$65,000 was naturally rejected in favor of ours, which was but \$30,000. The greater disparity of these bids presents a startling anomaly. The younger illumination distancing the older by the multiplication table in the reverse ratio, whereas by the law of economy of industrial development, and by virtue of its own superiority it should rather have been distanced itself. The action of the Board of Fire Underwriters in signifying their unwillingness to insure the exposition if gas was used; and subsequently insuring, when the Edison light was used, conveys its own story.

In New Orleans, 1884, 1885, the only satisfactory lighting done was by the Edison Incandescent. It was selected for the Administration Buildings, The Art Gallery, The Music Hall, and those places which, subsequently proved to be the rendezvous for the amusement-seeking patrons of the great fair. The "Arc" lighting in the other portions of the building was practically discontinued for the reason that it was not needed, thus showing that the administration had selected the Edison Incandescent for such places, as they anticipated

actual illumination would be required, and introduced the Arc as a temporary provision.

The New Orleans Exposition afforded several very excellent opportunities for comparison between the Incandescent and Arc methods of electric illumination:

In the Main Building=1,541,800 sq. feet, there were employed:

1,786 Edison 16-C. P. Lamps=28,576 candles, covering an area of 210,125 sq. feet=1 candle per  $7\frac{1}{2}$  sq. feet.

800 Louisiana Arc Lamps=2,000 C. P.=1,600,000 candles, covering 1,331,075 sq. feet=1 $\frac{1}{4}$  candle per 1 sq. ft.

In the Government Building, area 624,873 sq. feet.

885 Edison Lamps, 16-C.=each, 14,160 candles, area 124,848 sq. feet=1 candle per 8 $\frac{1}{2}$  sq. feet.

300 Brush Arc Lamps=2,000-C. each=600,000 candles, area 800,025 sq. feet=1 $\frac{1}{2}$  candle per sq. foot.

Other spaces showed an equal disproportion of effective utility.

The general effect at the same time was decidedly in favor of the Incandescent as compared with the Arc.

#### OUR PATENT SUITS.

In the suits we have brought against infringing companies, the defendants have until the first of July in which to file their answers to our bills of complaint. No development which will be of interest to agents need be expected until after that time. In one of the minor suits, however, an answer has been filed, reference to which is made in the following letter from our attorney:

NEW YORK, June 1st, 1885.

EDWARD H. JOHNSON, Esq.:

DEAR SIR:—As yet but one answer has been filed to the bills of complaint in the suits recently instituted by us. The answer discloses

no defense not anticipated by us, and we feel, therefore, increased confidence of sustaining our patent sued upon and of ultimately obtaining the injunction asked.

Yours respectfully,

JOHN C. TOMLINSON.

Whenever anything of interest occurs in the matter of this patent litigation, agents will be duly advised.

EDWARD H. JOHNSON,

President.

## BULLETIN NO. 6.

# THE EDISON ELECTRIC LIGHT

IN USE IN SOME OF THE

PRINCIPAL HOTELS, APARTMENT HOUSES, &c.

THE EDISON COMPANY FOR ISOLATED LIGHTING.  
65 FIFTH AVENUE.

New York, July 25, 1885.

### ADVANTAGES OF LIGHTING HOTELS BY THE EDISON SYSTEM.

The popularity of a hotel is dependent, not only on the elegance of its appointments, and the perfection of its service and cuisine, but also on the appearance of brilliancy it presents.

It is, therefore, essential that the system of illumination used shall be as nearly perfect as possible. There are no means by which a hotel can be so well lighted as by the *Edison system of incandescent lighting*.

The brilliancy and steadiness of the *Edison* lamp makes it especially suitable for lighting the halls and offices.

The appearance of handsomely decorated corridors is greatly added to by the effect produced by this light, which may be made to form quite an important part of the decorations themselves.

In the dining-room, where a very large space has usually to be lighted, and where a perfect diffusion of light is very desirable, the comfort of the guests may be greatly added to by the adoption of the *Edison system*.

The use of gas in this apartment is usually accompanied by a very unpleasant state of the atmosphere, owing to the very large number of burners which are, as a rule, required

to light the room, and the difficulties of properly ventilating the apartment, which are ordinarily great, are largely increased in consequence.

Moreover, instead of the dining tables being thoroughly lighted where gas is used, it is, to a great extent, effective only in illuminating the ceiling, a condition which does not exist in the case of the use of the Edison light, owing to the fact that the latter may be so arranged as to distribute the light in any desired direction.

In the reading-room the electric light can be so arranged as to enable guests to read or write with the aid of a lamp brought in close proximity to them.

If such an arrangement is made with gas, the heat which it causes makes it very disagreeable to those using the light, and, moreover, a gas jet cannot be inverted so as to focus the light on a desk or table, and it is impossible to get so effective an illumination as in the case of the use of the Edison system.

A drawing-room illuminated by the Edison system presents a most cheerful and attractive appearance.

The effect of handsome furniture is greatly augmented by its use, and the comfort of the guests is increased, as the atmosphere remains pure.

The use of the Edison system in bed chambers lessens greatly the chances of fire.

No matches are required, and there is an entire absence of an exposed flame, which, in the case of gas, is a frequent cause of danger to life and property, owing to the carelessness of guests in bringing the burner in close contact with inflammable material, or by the thoughtless disposition of the matches used to light the gas.

Moreover, death has been frequently caused from suffocation, by guests foolishly blowing out the gas, instead of turning it off, and consequently allowing the gas to escape, and the poisonous atmosphere produced thereby is inhaled, and often with fatal results before the trouble is discovered.

The Edison light cannot be blown out, it gives off no poisonous gases to vitiate the atmosphere, and it is, therefore, pre-eminently adapted to all the purposes of hotel lighting.

Probably in no part of a hotel is the matter of illumination of such importance as in the billiard-room.

The flickering light of a gas jet, the shadows it casts, and the heat it produces, render it a very undesirable light for the billiard player.

From the fact that the light has to be brought so near the billiard table, and the brilliant illumination required, the game in the summer becomes more a task than a pleasure, as the heat produced is, as a rule, quite unbearable.

Where the Edison system is adopted, a billiard table can be perfectly illuminated in the most brilliant manner possible, with a light which does not flicker, which produces no shadows, and which is practically devoid of heat.

Thus the comfort of the billiard player can be greatly added to, and the billiard-room, instead of being empty in summer, owing to the heat from gas, can be made as remunerative as at other seasons of the year.

Moreover, it should be borne in mind that the Edison light does not give off any destructive properties, such as those produced by gas, which ruins decorations and add greatly to the running expenses of the hotel, by requiring frequent renovation.

Furthermore, the wastefulness of servants can be held in check, as the lights of the whole hotel, or any part of it, can be readily arranged so as to be controlled from the office.

#### EXTRAORDINARY ECONOMY OF THE EDISON SYSTEM WHERE STEAM IS USED FOR OTHER PURPOSES.

Almost every modern hotel and apartment house is furnished with elevators, pumps, steam heating and refrigerating apparatus.

Under these conditions an engineer is of course required, and, inasmuch as the exhaust steam from the engines used to operate the dynamos can be used for heating and other purposes, it has been found, in actual practice, that the power for producing the electric light costs practically nothing.

It has, therefore, been demonstrated that what in the early stage of our enterprise was regarded as a great luxury has now become, especially in large hotels, a matter of economy and necessity.

Special attention is called to the Murray Hill Hotel, in this city, which is one of the newest and finest hotels in the United States.

In this most completely appointed establishment one bank of boilers is made to heat the building, operate the dynamos for producing light, make all their ice, maintain their refrigerating apparatus for preserving meats, game, &c., run their elevators, do all their pumping, and, in short, do everything that can be done in a building of this character where power is required.

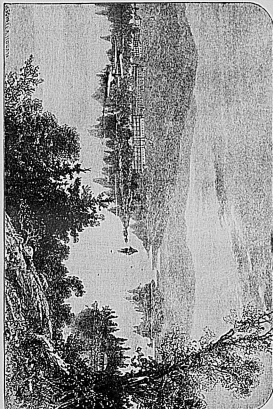
Where these conditions exist, it has been found that the cost of the light has been limited to interest on the investment, repairs and renewal of lamps, which three items combined have, in some instances, not exceeded an equivalent of gas at forty cents per thousand feet.

These most gratifying economical results, together with the luxury of the light itself, have ensured the introduction of the light in all first-class hotels in the country, the only question being one of time.

#### PROSPECT HOUSE, BLUE MOUNTAIN LAKE.

350 EDISON LAMPS.

This elegant and commodious house is situated in the heart of the Adirondacks, two thousand feet above the level of the sea, and having all the improvements and modern con-



ILLUSTRATED BY 350 EDISON LAMPS.

PROSPECT HOUSE, BLUE MOUNTAIN LAKE.

veniences for the comfort and accommodation of its guests, was the first hotel in the world lighted by incandescent lights.

The house has a frontage of 225 feet, facing north, with a wing extending 160 feet to the south, and surrounded with a piazza 20 feet wide. It contains 260 large, airy and pleasant rooms.

*This house is illuminated throughout by the Edison Incandescent Light, being the first hotel in the world to introduce it in the sleeping rooms.*

#### TESTIMONIAL FROM MR. DURANT.

(Copy.)

PROMPT HOUSE, Blue Mountain Lake,  
New York, July 13th, 1883.

EDISON CO. FOR ISOLATED LIGHTING, 65 Fifth Avenue, N. Y. City.

GENTLEMEN—I believe the Prospect House was the first hotel in the world to be illuminated by incandescent lights.

The Edison System was put in operation in October, 1881.

I take pleasure in stating that although installed in the early stage of the business, it has worked with perfect satisfaction up to the present time.

I consider it perfectly safe, economical, reliable, and in every way a superior light to any other method of illumination in existence, and can most cheerfully recommend it as a perfect light for use in hotels.

Yours, &c.,

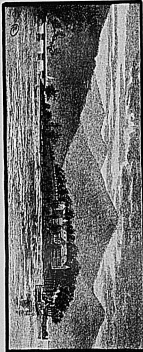
(Signed)

F. C. DURANT.

The Sagamore Hotel, situated on Green Island, near Bolton Landing, Lake George, N. Y., is a beautiful and comfortable summer hotel, owned by some wealthy Philadelphian gentleman.

This hotel was built early in 1883, and thoroughly equipped with the Edison system during its erection. All of the bedrooms are lighted, as well as the parlors, offices, dining-rooms, halls, &c. There are about 400 lamps distributed throughout the building. In addition to the lighting in the hotel, the current is supplied to several private cottages, located near by in the surrounding grove.

The illustration of the "Sagamore Hotel" will give our readers an idea of the pleasures to be derived from outdoor life in this delightful region, as well as the comforts which await the guests within, and the following testimonial from Mr. M. O. Brown, manager, attests to the satisfactory character of the Edison light:



THE SAGAMORE HOTEL.

425 BROWN LANE.

## THE KADAMORE.

BOLTON LANSING, LAKE GEORGE, N. Y.

M. O. BROWN, Prop.

J. H. VAIL, Esq., Gen. Sup., New York.

JULY 13, 1885.

DEAR SIR:—The Edison Light has been in use at the "Kadamore," Bolton, Lake George, N. Y., for two seasons, and part of the third. In every particular it has given the most perfect satisfaction, and I cheerfully recommend it as a hotel light.

Very truly yours,

(Signed)

M. O. BROWN, Prop.

## FINAL RESULT OF THE LAMP TEST AT THE FRANKLIN INSTITUTE, PHILA., PA.

In the lamp test made at Philadelphia in the spring of 1885, 29 lamps each of the following styles, namely, the Edison, the United States Co. (Weston), the Woodhouse (Stanley), and 11 of the Woodhouse & Rawson Co.'s, were placed in separate boxes, and resistance so arranged that each lamp could be burned at normal candle power. The intention was to test the lamps until one style showed "decided superiority" as over the other, replacing broken lamps by others. The first four lamps of the United States Ingushouse Co. (Stanley) were thus replaced, giving a trial for life upon more than 29 lamps of each of these competitors. The Committee having the Test in charge finding that all lamps but the Edison were giving out so rapidly, concluded that it was not worth while to substitute new lamps for those broken. This makes the final result after 1065 hours continued testing as follows:

Edison lamps, broken.....	1 out of 51
Weston lamps, broken.....	17 " 24
Stanley lamps, broken.....	19 " 22
Woodhouse & Rawson lamps, broken.....	All " 11

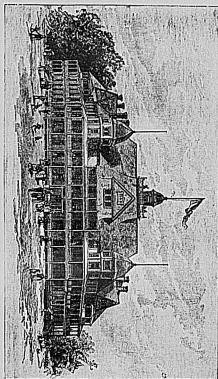
At the end of 500 hours testing the Committee were unanimously of the opinion that the Edison Co. had won and that there was no need of carrying on the test further. The Edison Company were desirous that a record of at least 1000 hours burning should be obtained from the Edison lamps. The Committee assented on condition that the other lamps should be tested. Thus with lamps which had burned over 500 hours the Edison Company were willing to race with lamps fresh from the makers. The result of this second competition is as follows:

Edison Co., entering the Edison lamp, lost one lamp out of 21 in 1,065 hours.

United States Co., entering Weston's 70 volt paper lamp, lost 3 out of 10 in 504 hours.

W. H. Prevee, F. R. S., entering the Woodhouse & Rawson lamp, lost 6 out of 10 in 332 hours.

Unknown parties entering the "Sun" lamp, lost 3 out of 10 in 308 hours.



HOTEL KADAMORE, MT. MCGREGOR, N. Y.

Illuminated by 250 Edison Lamps.

This is a new summer hotel, opened in 1884. It is situated on the summit of Mt. McGregor, about twelve miles from Saratoga, N. Y. It is now prominently known throughout the United States as the late residence of General Grant.

A plant of 60 lamps was started in 1884. This has been increased this year by the installation of a 200-light dynamo and 200 lamps.

The parlors, dining-rooms, offices, corridors, reading-rooms and piazzas are lighted, and in addition to these, the railroad depot, Gen. Grant's cottage, and the cottage of Mr. W. J. Arkell.

*An important fact to be kept in mind is, that in all of these hotels the Edison light is the only source of illumination; that it has proved reliable, and that it is not accompanied by a reverse of gas light.*

#### THE MURRAY HILL HOTEL.

The Murray Hill Hotel is located on Park avenue, extending from Fortieth to Forty-first streets, New York City.

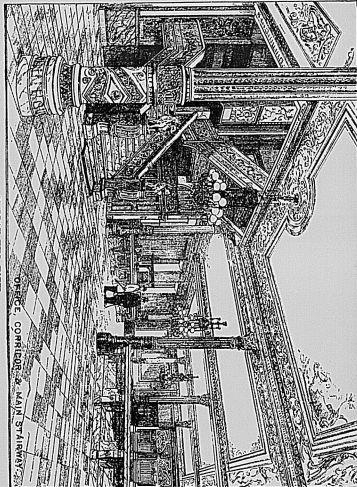
This is without doubt the most completely appointed and elegantly fitted hotel in the United States.

The entire first floor, including the elegant offices, parlors, dining-rooms, corridors, cafe, billiard-room, basement, cellars, etc., are illuminated throughout with about 950-16 C. P. Edison lamps. An annexed building on Fortieth street, recently leased, is now being wired.

The plant in this building originally consisted of one 400-light dynamo and one 300-light dynamo. Separate engines and reserve power are so arranged as to make the plant very reliable.

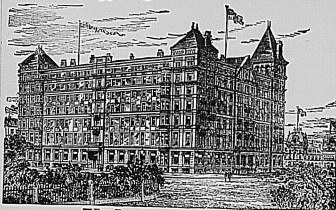
The Edison lamps are attached to costly electroliers of crystal, and highly finished and expensively wrought metals. The light here appears under advantageous circumstances, and the rich surroundings are additionally beautified by its superior fitness for the place.

*Another 400-light dynamo has been added to this plant, making total capacity eleven hundred lamps.*



MURRAY HILL HOTEL.  
OFFICE, CORRIDOR, & MAIN STAIRS, ETC.

## MURRAY HILL HOTEL



THE EDISON CO. FOR INCANDESCENT LIGHTING, NEW YORK CITY.  
 LIGHTED BY 950 EDISON LAMPS.

## TESTIMONIAL.

## MURRAY HILL HOTEL,

Park Avenue, 40th and 41st Streets, New York.

New York, July 15th, 1885.

TO THE EDISON CO. FOR INCANDESCENT LIGHTING, NEW YORK CITY:

The Edison incandescent light used in our hotel, for steadiness and brilliancy, is very superior and perfectly satisfactory.

HUNTING & HAMMOND,  
 Murray Hill Hotel.

## THE HOTEL EVERETT.

The Hotel Everett is located at No. 84 Chatham street, New York City.

A plant of one engine, two dynamos and about 135-16 C. P. lamps was installed and started in March, 1882, in this hotel.

The lights are distributed throughout the two large restaurants, kitchen, ladies' and gents' parlors and offices, and also in the basement.

Mr. Everett was at once satisfied that he had made a good investment in purchasing the Edison light, and after using it about a year gave us a most satisfactory testimonial of its merits in the shape of an order to install a plant in the large Everett Hotel in Vesey street and extending through to Barclay street.

This installation comprises a large engine and two dynamos and over 325-16 C. P. lamps. The dining-rooms, bar, offices, parlors, corridors, kitchen, &c., are thoroughly illuminated.

## THE BEERS HOTEL, ST. LOUIS, MO.

This is a new and elegant family hotel of moderate size, recently opened.

This building is lighted throughout with over 300 Edison lamps.

The plant consists of an engine and a 200-light dynamo.

A new addition to this hotel has recently been finished, and this is also lighted.



## THE PLANKINTON HOUSE, MILWAUKEE, WIS.



230 EDISON LAMPS.

(Copr.)

MILWAUKEE, WIS.

Office of the Plankinton House.

WESTERN EDISON LIGHT CO., CHICAGO, ILL.

GENTLEMEN—In reply to yours of the 21st will state that the Edison Electric Light Plant installed by you in this house has been in operation for over a year, and has in every way given me entire satisfaction.

It is all you have claimed for it in every respect, easily managed and operated by the servants about the house. It is run from the engine which had run the arc lights, and is perfectly steady. I am pleased with it beyond expression, and do not see how it could be improved on.

Yours truly,

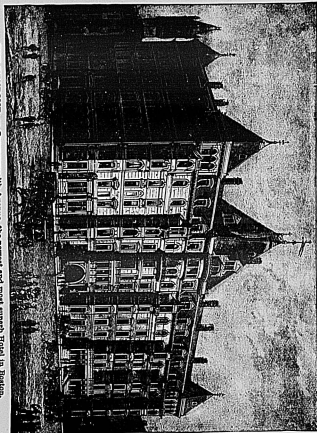
(Signed) JOHN PLANKINTON.

BUCKINGHAM HOTEL, 5th AVENUE &amp; 50th STREET, NEW YORK.

700 EDISON LIGHTS.

A large and elegantly fitted up addition to this well-known hotel has been equipped for the Edison light.

The reception rooms, parlors, offices, corridors, and dining-rooms in the older portion are now being wired. The plant is located in the cellar of the main building.



THE VIEW FROM, on Commonwealth Avenue, the present and most recent hotel in Boston.

A plant of moderate size was installed in this hotel in April, 1882. The main dining-room, offices, bar-room, laundry and pantries are lighted in a most satisfactory manner.

## THE HOTEL RENNERT, BALTIMORE, MD.



300 EDISON LAMPS.

This large and elegant hotel, built by Mr. Robert Rennert, will be opened within a few weeks.

No expense has been spared in obtaining all the most desirable modern improvements which will in any manner cater to the comforts of the guests.

The entire first floor and basement is brilliantly illuminated with the Edison light.

THE ST. CHARLES HOTEL, New Orleans, was equipped with 180 Edison lamps in 1883.

THE HOTEL ROYAL, New Orleans, was equipped with about 350 Edison lamps in 1884.

Col. Rivers is proprietor of both hotels.

## THE DAKOTA HOTEL AND APARTMENT HOUSE.

5,000 LAMPS.

In February, 1883, we entered into a contract with the Clarke Estate for wiring the Dakota Building, Seventy-third street and Eighth avenue. This is one of the most magnificent apartment houses ever erected in New York City, and occupies the entire block from Seventy-third street to Seventy-fourth street on Eighth avenue. We commenced wiring the building early in the spring of 1883, and, although one of the most extensive pieces of work ever undertaken by the company, the entire wiring system is so perfect that in the candle power equal brilliancy is procured. There are about 2,000 outlets wired for a capacity in the conductors of upwards of 7,500 lights. All of the rooms are not occupied, and the owners started in with the intention of putting in dynamo power to meet present requirements. With this end in view, a plant of 1,000 lamps was purchased and installed, which supplies light at the present time. On the north side of Seventy-third street, opposite the Dakota, the same estate

built twenty-seven private residences, all of which have been wired for the Edison system, providing for the distribution of about 2,500 additional lights. We therefore have in the above houses and the Dakota Building a total wiring for upwards of 10,000 lamps. The street conductors for supplying the twenty-seven houses with current are not yet in, so that our light is not being used in the houses themselves. The fixtures are all put up and provided with sockets, and it is expected within a short time that the street mains will be laid and the twenty-seven houses connected with the dynamo station. This station is located in the rear of the Dakota Building, and when the installation is completed it will be practically a "central station," supplying 200 families. Both the private houses and the Dakota rank among the very first buildings in the city for elegance of finish and substantial construction.

#### STOKES' RESTAURANT, WELLES BUILDING.

This elegantly appointed restaurant, located in Beaver street opposite the new Produce Exchange, was originally lit by a Weston dynamo with Maxim lamps. Owing to the unsatisfactory operation of the apparatus, the plant was thrown out, an Edison dynamo purchased and the entire restaurant lighted with Edison lamps. The Edison light has continued to give abundant satisfaction, the plant was promptly paid for, and the purity of the atmosphere and the quality of the light comprise the chief attraction of the place, which is daily crowded.

#### THE "OSBORNE."

1,700 EDISON LIGHTS.

Just as we are going to press, we have closed a contract for lighting The Osborne, now being completed on the corner of Seventh avenue and Fifty-seventh street in this city. This is one of the largest and best appointed apartment houses in the city, no expense having been spared to make its attractions exceed anything of the kind in the United States, and the adoption of the Edison system has been the result of a thorough and intelligent examination of every known system of lighting. The entire building will be lighted throughout with about 1,700 Edison lamps, of which not the least advantage will be the saving of decorations, which are to be of the most elegant and costly character.

We have given above sketches of the principal hotels and apartment houses now lighted by the Edison system, a full list of which will be found on another page.

# DANGER TO HUMAN LIFE, AND DEATH FROM GAS USED IN HOTELS.

The full statistics have never been written on this subject, but almost every hotel proprietor has had his own experience.

The following notes have been gathered from time to time during the past three years:

Charles Neiman, Baltimore, was found insensible in his room, which was filled with escaping gas.

Christine Kereswara was found unconscious in bed at 215 Canal St., New York City, the room being filled with gas escaping from an unlighted burner.

Charles Kuhn was found unconscious in his room at the *Van Dyke House, New York City*, the gas being turned on, but not lighted.

A young woman named Hansen, was found unconscious in her room at a hotel in Waterbury, Conn., having blown out the gas when she retired the previous night.

Carl Witte, Henry Gilsick and Herman Leinester were found unconscious in the room occupied by them at the *College Place Hotel, New York City*, having been asphyxiated by escaping gas. They were removed to the hospital.

Two young girls were recently found dead in their bed at 559 Third Ave., New York. There were two gas jets in the room, and probably both jets had been turned on in the darkness and only one had been lighted. The escape of gas from the other jet caused the deaths.

The Chicago "*Tribune*" stated that Mr. Downing Vaux has been seriously ill in consequence of gas-poisoning. The gas in his room was left burning low at night and a puff of wind extinguished it. For some time the injury was thought to be permanent.

Thomas C. Hongland, a traveling agent of a New York

wholesale warehouse, was found in his room at the *American House, Dover, N. H.*, asphyxiated by escaping gas.

John Welko, of 149 West street, New York City, was found in his room in an unconscious condition. The gas was turned on.

A man named Fernow was found in bed insensible at a hotel, No. 39 Bowery, New York City, the room being filled with gas escaping from a defective pipe. He was removed to a hospital, where he subsequently died.

W. S. Lawrence was found dead in bed at the *Potnam House, 4th Ave. and 20th St., New York City*, having been suffocated by illuminating gas with which the room was filled.

Luther Tucker was found suffocated to death by gas in the *Kimball House, Dover, Mass.*

Mr. Joseph A. Stafford, of Queen Anne's County, was found in bed in an unconscious condition in his room at *Dock's Hotel, St. Louis, Mo.*, from the effects of inhaling gas, which it is supposed he blew out instead of turning off.

William Toland was stopping at the *Washburn House, Detroit, N. Y.* A chambermaid passing through the hallway noticed a strong smell of gas coming from Toland's room. He was aroused and seemed to be very little affected. Later in the day, however, the poison he had inhaled made him quite ill, and the services of a physician were called into requisition.

Mr. E. O. Keller was found in bed in his room at the *Southern Central Hotel, Baltimore*, having been suffocated by illuminating gas which was escaping from an open burner in the room.

W. P. Winfield was found dead in his room at the *Sherman House, Indianapolis, Ind.*, the room being filled with gas which was escaping from the fixture.

Albert Taft, of Burlington, Ky., was found dead in his bed, having been suffocated by gas which had escaped from an imperfect fixture.

Samford Sheridan and George Smith were found unconscious in bed at the *Van Dyke House, New York City*, the room being filled with illuminating gas.

William Muskin and his wife arrived in this city by Cunard steamer, "*Batavia*," registered at the *Engle Hotel, Morris St.*, and retired. About noon next day they were called, but no answer being received, the door was broken in and they were found in bed insensible. The apartment was filled with gas which was streaming from the burner. Both died within two days from the effects.

A guest who arrived at *Picock's Hotel* registered as R. P. Covert, Providence, R. I., retired to bed late in the evening. About noon an employee of the hotel found him insensible. Medical aid was summoned, but the man died at one o'clock P. M. Death was attributed to suffocation by gas.

The New York "*Times*" contains an item to the effect that John Hans, a Chinaman, blew out the gas in a room he occupied in the *Van Dyke House*, and he was found dead, from the effects of escaping gas, in the morning.

Mrs. Annie Stadelmeier, of Newark, N. J., was found in her bed at *Hartmann's Hotel, 37 Borey, New York City*, unconscious and apparently lifeless. The room was filled with gas, which was escaping from the two jets of the centre chandelier. It was stated she could not recover.

H. P. Keys, of Hillsboro, Pa., was found in a dying condition in his room at the *Valentine House, Washington, Pa.* The room was filled with gas.

A man giving his name as Jack Stiles, of Brooklyn, N. Y., was found dead in bed at the *United States Hotel, Newburgh, N. Y.*, suffocated by gas which was turned on in the room.

Hiram Tucker, of Boston, was found dead in his room suffocated by gas.

Daniel J. Leamy was found dead at No. 48 Chatham street, New York City, having been suffocated by gas which had leaked from defective gas pipe in his bedroom.

Richard McGrann was found in his bedroom at the *City Hotel, Lancaster, Pa.*, unconscious, the room being filled with gas which was flowing from the burner.

James McGrath and wife were found insensible in bed at a hotel in Scranton, Pa., the room being filled with escaping gas. It was said by the doctors that Mrs. McGrath could not live.

Stewart Vanderbilt was found unconscious in his room at the *Grever House, Easton, Pa.*, having been overcome by escaping gas. His recovery was uncertain.

Lewis McCann and wife were found dead in bed at the *Ador Plaza Hotel*. They had evidently been suffocated by the gas, which was turned on.

Jacob Osterhout, of Rosendale, was found suffocated in his bed at the *Mansion House*, having blown out the gas upon retiring.

O. D. Miller was found in a dying state on his bed in the *Consolidated Hotel, New York City*, suffering from asphyxia, caused by inhaling gas, and the gas was found turned on.

Emma Strauss was found dead in her room at No. 90 Cortlandt street, in this city, the room being filled with illuminating gas. It is supposed she blew out the gas before retiring.

Theodore Husky and William Husky were found dead in bed in their room at the *Anson Hotel, Brooklyn*, having been suffocated from gas with which the room was filled. The gas was not turned off.

The foregoing records show how it's done and are facts which speak for themselves. In addition to the above we record a few more names without going into details:

R. E. Stillwell, North River Hotel, N. Y.

T. Coleman, Putnam House, N. Y.

J. Rahn, Central Hotel, N. Y.

H. Knapp, Central Hotel, N. Y.

J. McCarty, Grand Union Hotel, N. Y.

Rev. A. Green, Hamilton House, N. Y.

- D. G. Eichelberger, Grand Union Hotel, N. Y.  
 Three circus men, known as "Shanghai," Darkey & Leachy, Putnam House, N. Y.  
 P. S. Durand, Occidental Hotel, N. Y.  
 R. H. Stryker, Bridge Hotel, N. Y.  
 William Thomas, Van Dyke House, N. Y.  
 Mrs. Catharine Hottelmuith, Bowery Hotel, N. Y.  
 Mrs. Dorothea or Josephine Parant, Sturtevant House, N. Y.  
 Delegation of Indians, Washington, D. C.  
 A. H. Van Riper, Peckness, Passaic, N. J., Passaic Hotel.  
 M. Maclear, 259 Montgomery street, Jersey City, No. River Hotel.  
 A. E. Stowe, Saratoga, N. Y.  
 Patrick Doud, Pennsylvania House, N. Y. City.  
 Mrs. Patrick Doud, " " " "  
 Wells Brainerd, Clinton Hotel, Philadelphia.  
 William Mulcahy, Brooklyn Bridge Hotel, N. Y.

#### WINDOW CURTAINS SET ON FIRE BY GAS JETS.

##### A SHORT RECORD OF DAILY OCCURRENCES.

- A fire occurred at 134 West 22d St., N. Y., caused by a curtain coming in contact with a lighted gas jet. Damage, \$200.  
 A fire was caused by a lighted gas jet in the store No. 716 Third Ave., N. Y. Damage to extent of \$300.  
 A curtain caught fire from a gas jet at 222 Grover St., New York City, causing a fire which did damage to the amount of over \$500.  
 At 2338 Third Ave., N. Y., a fire was caused by a gas jet in the window of Garbutt Cohen coming in contact with goods.  
 The window curtains in a bedroom in the residence of Mr.

M. I. Townsend Barden, 111 Fifth Ave., N. Y., took fire from a gas light. The damage was estimated at \$800.

A fire doing damage to the extent of \$100 in the residence of Col. Chas. H. Taylor, 108 Charles St., Boston, Mass., was the result of a window curtain catching fire from a gas jet.

A window curtain caught fire from gas in the top floor of No. 113 East 29th St., New York City, and caused a fire resulting in a loss of \$500.

A window curtain in the house of Oscar Bennett, 253 Mulberry St., N. J., came in contact with a lighted gas jet. The result was a fire and loss of \$100.

At 45 Nassau St., Brooklyn, N. Y., a window curtain came in contact with a lighted gas jet, causing a fire and damage to the amount of \$200.

Goods in the window of W. H. L. Jones & Co., 339 Eighth Ave., N. Y., caught fire from a gas jet, doing damage to amount of \$100.

A window curtain coming in contact with a gas jet caused a fire at 109 East 70th St., N. Y.

A fire occurred March 8th, at 39 Prospect Place, Brooklyn, by a window curtain coming in contact with a gas jet.

Window curtains catching fire from a gas jet caused some slight damage at 208 East 48th St., N. Y.

A lighted gas jet set fire to a curtain at 108 Fourth Ave., Brooklyn, N. Y., doing damage to the extent of \$100.

Two fires were caused at 81 Fourth St. and 48 Garden Place, Brooklyn, N. Y., by window curtains coming in contact with gas jets.

A fire occurred at 135 Bedford Ave., Brooklyn, caused by a curtain coming in contact with a lighted gas jet.

# OTHER ACCIDENTS FROM USE OF GAS IN HOTELS AND RESTAURANTS.

A series of violent explosions occurred in the east basement of the *Palma Hotel, San Francisco*, which were followed by a volume of flame pouring into the street from the place in the sidewalk where light was admitted into the vault through plates of thick glass. The cause of these explosions was the breaking in two of an eight inch gas main while some plumbers were connecting a pipe with the 1,500 light gas meter which had just been placed in position. The escaping gas had ignited and exploded with great force, shattering to atoms the thick glass plates over the vault. Part of the meter, which was of three-quarter inch iron, was also blown to fragments. The volume of flame from the ignited gas was very great, and but for the prompt action of the firemen, would probably have done great damage to the hotel. Twenty-four persons were injured, most of them badly, and three or four dangerously.

While the gas was being drawn off from a tank at a hotel at Woonsocket, an explosion occurred, by which several persons were injured, and property worth \$5,000 was destroyed.

A leaky gas pipe in a restaurant in Buffalo caused an explosion, whereby four persons were badly injured, and the building and contents damaged.

Gas escaping from a leaky meter in Moyer's saloon, Chicago, caught fire and exploded, blowing out the front windows of the saloon, and severely burning the proprietor.

An explosion of gas in Hollander's Restaurant, New York City, injured two men and caused damage to the amount of \$500.

Escaping gas at the *Union Club House, Chicago*, caused an explosion and damage to the amount of \$500.

# LIST OF HOTELS AND APARTMENT HOUSES ILLUMINATED BY THE EDISON SYSTEM.

## ISOLATED PLANTS.

NAME.	ADDRESS.	No. of Lamps.
Edmund Hotel.....	Mount McGregor, N. Y.....	250
Barrington Apartment House.....	New York City.....	150
Mrs. Harriet Davis Hotel.....	St. Louis, Mo.....	300
Buckingham Hotel.....	New York City.....	700
Balden Park.....	New York City.....	5000
Everette Hotel.....	Veroy St., N. Y. City.....	350
Hotel Everett.....	94 Church St., N. Y. City.....	140
Hotel Vendome.....	Boston, Mass.....	60
Hotel Royal.....	New Orleans, La.....	350
Murray Hill Hotel.....	New York City.....	350
Marlton Iron Spring Co. Hotel.....	Seattle, Col.....	100
Osborne Place.....	New York City.....	1700
Perspect House.....	Rose Mountain Lake, N. Y.....	350
Pinkerton House.....	Milwaukee, Wis.....	330
Russell's Hotel.....	Baltimore, Md.....	300
Sagamore Hotel.....	Lake George, N. Y.....	435
St. Charles Hotel.....	New Orleans, La.....	380

NOTE.—The Hotels marked \* are supplied with current from the Central Stations of our local companies. The exact number of lights in each of these Hotels supplied from Central Stations is not accurately known, but the total number is about 1,200 lamps.

NAME.	ADDRESS.	No. of Lamps.
*U. S. Hotel.....	Harrisburg, Penn.....	1500
*Hilton House.....	" " " ".....	
*Larchmont Hotel.....	" " " ".....	
*National Hotel.....	" " " ".....	
*Windsor Hotel.....	Cumbersford, Md.....	
*St. Nicholas Hotel.....	Brooklyn, Mass.....	
*City Hotel.....	Williamsport, Penn.....	
*Central House.....	" " " ".....	
*Hotel Brunswick.....	Lawrence, Mass.....	
*Hartland House.....	" " " ".....	
*Arling House.....	Davenport, Iowa.....	

EDWARD H. JOHNSON,  
President.

No. 7.

## BULLETIN FOR AGENTS.

THE EDISON COMPANY FOR ISOLATED LIGHTING,

65 FIFTH AVENUE.

New York, August 19, 1885.

### CONTRACTS CLOSED.

Since June 21 we have closed 43 contracts, for isolated plants, aggregating 11,763 lamps. The Western Edison Light Co. have installed 11 isolated plants of 3,573 lamps capacity. In addition to this we are installing 7 central stations with capacity for 8,300 lamps, making a grand total of 23,736 lamps. The business for the month of July exceeds that of any previous month in the company's history. In view of the fact that summer is generally a dull season for our business, and the further fact that we have had to contend against unscrupulous competition and false assurances on the part of contending companies, this showing reflects great credit on our agents, and is powerful evidence of the merits of the Edison system. The following is a list of the isolated plants contracted for:



SOLE BY	PER ORDER	No. LAMPS.
Benton & Hughes.....	The steamer "Deux Richmond," New Jersey Steamboat Co., New York City.....	75
Benton & Hughes.....	The steamer "Deux," New Jersey Steamboat Co., New York City.....	75
Benton & Hughes.....	Vacuum Oil Co., Rochester, N. Y.....	80
Benton & Hughes.....	Drs. Thomas and Chambers, Hospital Building, New York City.....	100
Benton & Hughes.....	J. Mazette, New York City.....	50
Benton & Hughes.....	Isidore Fink, New York City.....	1,700
Benton & Hughes.....	N. Y. Cable R. R. Co., New York City.....	300
Benton & Hughes.....	W. H. Franke, Apartment House, Seventy-seventh street and Madison avenue, New York City.....	300
Benton & Hughes.....	Powers Hotel, Rochester, N. Y.....	150
Benton & Hughes.....	Herkimer Paper Co., Herkimer, N. Y.....	100
Card, B. F.....	L. Steinhardt, Apartment House, New York City.....	100
Card, B. F.....	Givensham Bros., Silk Partery, West Hoboken, N. J.....	401
Card, B. F.....	Grand Central Depot, New York City.....	214
Clark, H. A.....	The steamer "Jaguar," Maryland Steamboat Co., Baltimore, Md.....	91
Clark, H. A.....	The steamer "Baltimore," Baltimore, Chesapeake & Richmond Steamboat Co., Baltimore, Md.....	91
Hix, W. P.....	Southern Flour Mill, St. Louis, Mo. (increased).....	75
Hix, W. P.....	Pierre Clouston, Grand Opera House, St. Louis, Mo.....	700
Hix, W. P.....	Kansas State Penitentiary, Lansing, Kansas.....	624
Hix, W. P.....	Woolrich & Sons (correspondent), St. Louis, Mo.....	125
Hix, W. P.....	Charles H. Pope, Theatre, St. Louis, Mo.....	400
Hix, W. P.....	S. B. Pierson's Sons, Flour Mill, Lawrence, Kansas.....	100
Hix, W. P.....	Kansas City Times, Kansas City, Mo. (wire).....	351
Hookin, John.....	W. S. Heger, Edge More Iron Co., Wilmington, Delaware.....	35
Humbold, A. J.....	Waldy & Co., Powder Mill, Tussum, Pennsylvania.....	25
Laxson, A. J.....	House of Commons, Ottawa, Canada.....	236
Laxson, A. J.....	Globe Printing Co., Toronto, Canada.....	91
Ludlow & Cooke.....	Hodman Manufacturing Co., La Fayette, Pa.....	61
Ludlow & Cooke.....	Lorraine Mfg. Co., Wenden Mills, Pawtucket, R. I.....	150
Markle, J. R.....	Northern House Aepfen, Traverse City, Michigan.....	620
Markle, J. R.....	Michigan State Prison, Jackson, Michigan.....	420

SOLE BY	PURCHASER	No. LAMPS.
Maritz, J. H.....	Kalamazoo Paper Co., Kalamazoo, Michigan.....	75
New York Office.....	E. S. Jaffray & Co., New York City (increased).....	400
New York Office.....	Second Avenue R. R. Co., New York City (increased).....	147
New York Office.....	Mattile-en & Wheeler, Sugar Refinery, Jersey City, N. J. (increased).....	1,200
Palme & Stickney.....	Prof. H. Carneliead, Bowditch College, Brunswick, Me.....	25
Palme & Stickney.....	Chemical Paper Co., Holyoke, Massachusetts.....	100
Palme & Stickney.....	Bottom Post Office, Boston, Massachusetts (increased).....	300
Palme & Stickney.....	Rutland Electric Light Co., Rutland, Vermont.....	350
Palme & Stickney.....	Melford Carpet Co., Malden, Massachusetts.....	200
Palme & Stickney.....	New England Conservatory of Music, Boston, Massachusetts.....	917
Sheldon, W. A.....	H. H. Shops of St. Paul & Northern Pacific R. R. Co. at Conne, Minnesota.....	343
Sheldon, W. A.....	Newman, Warner & Erich, Minneapolis, Minn. Paper and Pulp Mill, 60 lights.....	200
Tate, A. O.....	Montreal Post Office, Montreal, Canada.....	751
TOTAL.....		5,673

# PLANTS INSTALLED BY THE WESTERN EDISON LIGHT CO.

FROM JUNE 10TH, 1885.

	No. LAMPS.
Cleveland Milling Co., Cleveland, Ohio.....	60
Pullman Palace Car Co., Chicago, Ill.....	400
Milwaukee Industrial Exposition, Milwaukee, Wis.....	300
Chesham Improvement Co., Chicago, Ill.....	300
Arendon Mineral Springs Co., Waukegan, Ill.....	300
Chicago Opera House Co., Chicago, Ill.....	300
Marsfield, Field & Co., Chicago, Ill.....	100
A. Lamb & Sons, Clinton, Iowa.....	150
C. S. Clavier, Silverton, Cal.....	150
Illinois Eastern Hospital for the Insane, Kankakee, Ill.....	275
H. M. Kinley, Chicago, Ill.....	505
TOTAL.....	3,673

# 4 CENTRAL STATIONS IN COURSE OF CONSTRUCTION.

	No. Lamps.
York, Pa.....	1,000
Tennepet, Pa.....	1,000
McKeesport, Pa.....	1,000
Westchester, Pa.....	1,000
New Brunswick, N. J.....	1,000
Bessemer, Iowa.....	400
Des Moines, Iowa.....	300
<b>TOTAL.....</b>	<b>8,300</b>

## FIRST CENTRAL STATION DIVIDEND IN NEW YORK.

Early in July the Edison Electric Illuminating Company of New York declared a quarterly dividend of one per cent., which was paid August 1st. The company having put in its increased plant and being entirely free from floating debt, will continue to pay regular quarterly dividends aggregating 5 or 6 per cent. per annum on its present excessive capital stock. This announcement is specially significant when it is remembered that the station could be duplicated on one-half of its present capitalization, which would make our present dividends from 10 to 12 per cent. per annum, notwithstanding the poor character of the district lighted, owing to the absence of night lighting. The business of the company has never been in more prosperous condition, the entire capacity of the increased plant has been taken up, and we have been obliged to refuse a large number of additional applicants for the light.

## A NEWSPAPER CONVERTED.

During the early history of the Edison Electric Illuminating Company, of New York, we were made the subject of frequent criticisms and sarcastic remarks in the columns of the New York "Sun," that being the only journal in the city which contained unfavorable comments. As the

business progressed, however, their comments gradually changed in tone, until finally the entire premises of the New York "Sun" were lighted from our central station.

While this action in itself attests the progressive manner of the "Sun's" management, the following editorial which appeared in its columns on July 30th, entirely unsolicited by us, bears evidence of a very gratifying spirit of appreciation, and will be interesting to our agents:

"The Edison Electric Illuminating Company, which operates the electric light station at 397 Pearl street, announces a quarterly dividend of 1 per cent., payable August 1. This, we believe, is the first dividend the company has declared, although it has been supplying light to customers for nearly three years. Considering the money, labor and ingenuity expended, and the risk of loss incurred, the profits of the enterprise have thus far been very meagre, but no doubt the worst has been passed, and hereafter greater prosperity may be expected.

"In common with others who use its light, we have been entirely content with the regularity and steadiness of this company's services, and the comfort our employees have experienced during hot weather in being relieved of the glare of gas is of itself a sufficient compensation for the slight excess of the cost of the light over that of gas."

The allusion to "the slight excess of the cost of the light over that of gas" is conclusive evidence that there is very little difference between our price, which is supposed to be an equivalent of gas at \$2.25, and the present price charged by the gas company to large consumers, viz.: \$1.50 per thousand feet.

## COMPETITION IN GOVERNMENT BUILDINGS.

About a year ago the Treasury Department in Washington invited proposals for lighting the United States Custom House and Post Office in Chicago. The contract was awarded to the United States Electric Lighting Company as the lowest bidder. The U. S. Co. used every possible effort to make the plant a model one to the extent of their knowledge and ability. The following article appeared in the "Electrical Review" during the month of July:

The assistant custodian of the Government building here, in which the United States people placed incandescent lights last year, has received imperative orders to discontinue the use of the plant until further notice from Washington. This action is not from any dissatisfaction with the light; on the contrary, the Post Office employees have, since the installation of the plant, seen in high place, and profuse in their commendation of the light, its better quality as to heat, and its freedom from heat when compared with gas. The item of expense alone has induced the move—the difference in favor of gas for the same service being about \$1,000 per year. The gas bills were formerly about \$10,000 per annum, the electric light per-annum being \$8,000; supplies and incidentals, \$12,000; or a total of \$30,000.

It is estimated that the difference in thermal effect in favor of the electric illumination is about 50° Fahr. With such a slight as that of the 8th instant, when half the city slept in "sweet and agony" for covering, the thermometer ranging from 90° up, an addition bringing this to the level of 110° would rather tend to dampen the mental ardor, if it did not the physical condition, of the Post Office clerks, who are already bowling their disapproval of the change.

We, of course, cannot vouch for the above statement, but quote it for what it may be worth. As a contrast to the figures above given, the result of the last year's operation of the Edison plant in the Post Office and Subtreasury building in Boston, Mass., will be of interest to our agents. The cost of gas in this building had been between \$12,000 and \$13,000 per annum, while the cost of lighting the building by the Edison plant has been only \$6,000. This actual saving has already paid for nearly the entire investment in the plant. These results bear evidence to the folly of investing in inferior apparatus at a lower first cost at the sacrifice of cost of operation.

#### TESTIMONIALS FROM CENTRAL STATIONS.

A gentleman in a large western city having made inquiries of some of our local illuminating companies in the east has received the following replies:

#### OFFICE OF THE EDISON ELECTRIC LIGHT COMPANY.

YORK, PA., June 27, 1885.

MY DEAR SIR—In reply to yours of 5th, will state that we have not commenced operations yet, but expect to start in about three weeks. We organized about three months ago, commenced work then, and have everything complete now but putting in the electrical machinery. Whether it will pay as a dividend I do not know.

I have seen the light at New York, Newburgh, Cumberland, Harrisburg, Shamokin, Philadelphia and Baltimore, and have inquired of the consumers at each place, and never came across one that was not satisfied with the light; all liked it better than gas. In all places that I visited they charged a trifle more than gas, because people were willing to pay a little more than for gas.

We at York charge, or intend to charge, 1 cent an hour for a 10 candle power lamp, and 1½ c. per hour for 16 C. P. lamps. We have several contracts with consumers on this basis for one year. We have up to this date contracts for 800 lights, from which we will get a revenue of \$1.00 per month. Our expenses will be as follows per month: Sec. \$50.00, Electrician \$100.00, 2 Engineers \$80.00, Coal, Oil, Water, waste, etc., for one 80 H. P. engine for say 4 hours an evening, and about 10 horse-power the balance of the night. Our plant has a capacity for 2,400 lights, and will cost about \$20,000. Our population is 15,000, and from the experience of other towns we visited we expect all these lights taken in less than 6 months after we are started with a monthly revenue of \$110. Harrisburg, with a population of 40,000, started 2 months ago with an income of \$2,800 per month; expense, \$200 per month; capital, \$100,000. They have increased so rapidly, that income for July will be \$5,800; expense, \$1,000. From the experience that I have had, I am convinced that a station with less than 1,000 lights will not pay much of a dividend, but above that number, carefully managed, will pay a good dividend.

The charges at Harrisburg are the same as ours. Gas at York and Harrisburg rates for \$1.80 to \$2.00 per thousand.

Yours respectfully,  
J. WEST,  
Sec'y.

#### THE HARRISBURG ELECTRIC LIGHT COMPANY.

HARRISBURG, PA., June 27th, 1885.

DEAR SIR—Your inquiry concerning our station to hand.

I take pleasure in giving you our information as well give you an intelligent idea of the business. We started our station May 1st, and it has been running in a highly satisfactory manner to our consumers and our-

selves. We have a 4,000 light plant with capacity about taken. . . . We consider the plant a good success in every way—the character of the same and in the important matter of dividends. We expect our plant to pay us 20 per cent., which of course I give you in a confidential manner. However, we have the State buildings and grounds installed, for which we get \$4,000 a month. Our revenues exclusive of this are about \$1,800, which we will increase this fall, as the light is very much liked, with the exception of course of the few "kickers" which every community has.

We have all our hotels and almost sold the business section in the centre of the city, which only consumes two sides of the main street, 6 blocks long. Our expenses are about \$4,500 a month, but we run day and night, necessitating a double force of hands. Our dividend would not be so high without the capital, but no doubt would in course of time, nor would our expenses be so high. An important fact is, we started the first day with this assured revenue, contracts having been made for a year, by paying for the inside wiring.

Relative to its cost compared with gas, I have no doubt it could be furnished just as cheap, with profit, but fortunately found little difficulty in getting 20 to 25 per cent. more, than gas bills, placing it on merit and not alone on economy. Again, they use this percentage more of our light than gas, but we are running on contract system, having no meters in use. It makes a definite, assured income monthly, so irregularity and uncertainty of bills, and no meter men or meters. We are decidedly in favor of the contract system. The abuse of the light will not amount to as much as the expense of meters, exclusive of disqualification. Our hotels pay us \$800, \$1,200, \$1,500 per year. In the case of hotels the excess over gas is no great—probably 10 per cent. Kansas City with about 30,000 should pay well. We only have 35,000 population. No doubt we will light our street lamps next year, for which we expect to get \$40 per lamp for all light, every night. We have good territory in the upper portion of the city, to which we will extend. We have not given much attention to dwelling house lighting, having our hands full with better paying business. We have a few dwellings however.

We worked hard individually, making contracts, securing right of way, etc.

Your entire board will have to work in this matter; as a result we think we have a good thing.

Please to have you visit the first station in the country. Trusting the above will be of service to you, I am,

Very respectfully,

R. E. WALLOWER,  
Pres't. Hurlbush Elec. L. Co.

CINCINNATI, OHIO, March 19th, 1885.

DEAR SIR—The undersigned merchants of Cincinnati, have been using electric light during the past year instead of gas, and cheerfully give a comparison of the cost for corresponding months of each light. We find the light superior to gas in economy, brilliancy, steadiness and cleanliness, as there is no smoke from it. We should dislike very much to be compelled to return to gas.

	GAS.	ELECTRIC LIGHT.
S. Burch, Wholesale Groc.....	Dec. \$15.00	Dec. \$8.33
H. Harshbarger, Clothing.....	Feb. 4.75	Feb. 4.00
E. Alm & Co., Clothing.....	Dec. 28.60	Dec. 16.00
D. H. Moore, Hardware.....	Dec. 5.25	Dec. 3.50
Geo. Grogan, Jeweller.....	Feb. 3.82	Feb. 3.89
Hartmeyer & Sulley, Dry Goods.....	Feb. 9.60	Feb. 7.27
Evans & Kramel, Drugs.....	Nov. 11.25	Nov. 7.89

#### ABSOLUTE SAFETY OF THE EDISON LIGHT IN DISTILLERIES, OIL REFINERIES, &c.

To substantiate the above, we print the following letter, which explains itself:

DES MOINES EDISON LIGHT COMPANY.

Des Moines, Iowa, August 8th, '85.

J. H. VAIL, Esq., 65 Fifth Avenue, New York City:

DEAR SIR—Are just putting in a 100-16 candle power lamp machine in the largest distillery in the world, and they only put it in after the following tests. The very last French spirit was put in a large iron tank and a small fire put under it, and then three lamps were broken in the very strongest fumes, and out of the three only one set fire to the fumes, and that because as the shell of the lamp came off it brought the two ends of the wire that holds the carbons, so that a spark passed between. Then we took some of the same material and broke the lamps in the spirits, and none set fire to it. So you see that we have given it the most severe tests that we could and with much results that the company made a contract at once.

Yours truly,  
F. H. WHITTING,  
Superintendent.

# THE EDISON LIGHT IN WOBURN, MASS.

We print the following from "The Woburn Journal" of July 24th, 1885:

## THE ELECTRIC LIGHTS.

The business houses of this place were lighted with electricity for the first time on last Tuesday evening, by Mr. N. J. Simonds, from an Edison plant. It would seem as though everybody within a dozen miles was at once seen by every one that the enterprise was successful. For the reason that the machinery had been put in operation at a rather late hour, for thirty or forty minutes the full strength of the light was not obtained, but it soon got down to business and produced a most brilliant and satisfactory effect. In every place visited by the writer the proprietors were highly pleased with the light, the difference between which, in color, clearness, steadiness, etc., and gas was apparent. The temperature of the rooms, too, was noticed and favorably commented on. A fairly long-range observation of the lights gave rise to many compliments, for they showed off splendidly under such conditions. The cluster at Woodbury's corner, although only one-half of it was in operation, illuminated the surrounding grounds in fine shape.

The fact that Mr. Simonds received applications for additional light on Wednesday morning, was good proof of the satisfaction they gave on Tuesday evening. In fact, we have not heard a breath of adverse criticism of them; on the contrary, the consumers to man, so far as we have been able to learn, are pleased with the light from whatever point it may be viewed. Its full value was not expected to be developed at the moment of starting the machinery, because everything was new and it takes time to get in perfect working order; but the lamps did fine service, satisfactory to the takers, and the whole business was a pronounced and gratifying success.

The use of the lights on Wednesday evening was, if possible, more satisfactory than on Tuesday evening. Of course the machinery had got into better working order and probably produced some better results. But it was the first time, and from what parties who have the light were heard to say on Thursday, they could not be induced to dissent the electric lamps for any ordinary consideration. Everybody is perfectly satisfied with it, and new applications for it are coming in at the most encouraging manner.

# TWELVE HUNDRED EDISON LIGHTS IN VICKER'S THEATRE, CHICAGO, ILL.

This theatre has been entirely rebuilt, and is now considered one of the handsomest places of amusement in this country. The architects, Messrs. Adler & Sullivan, have remodelled the building in a most thorough and comprehensive manner. Recognizing the advantages to be derived from a proper application of the Edison light, the success obtained has been remarkable, as the following notice taken from "The Times," Chicago, Ill., July 1st, 1885, will show:

The lighting arrangement is simply superb. There are over twelve hundred Edison sixteen-candle lamps in the building. The arrangement of these numerous lights is entirely novel, and a new departure in lighting, and greatly adds to the brilliancy of the interior. The first view is from the entrance. Here the lights are arranged in clusters of three lights. Panning on one eight more clusters and two brackets, of very odd, yet elegant, design. Through another set of doors, and directly over the steps that rise to the foyer, in the panels are placed some twenty lights in the ornamental stucco-work. In the foyer are glass chandeliers with six lights in the centre. Two novel posts at the sides of five lights each. At the stairway leading to the ladies' retiring-rooms and gents' smoking-rooms are two very elegant ball lights of thirty-two candle-power light each. In the auditorium the scene is beautiful beyond description. Not only is the finest, softest, steadiest of light produced, but one wonders where it all comes from; for the arrangement is such that the form of lighting is artistic decoration, and at the same time the color decorations of the auditorium are shown to perfection. Around the boxes are thirty-two lights, arranged singly and in clusters, hidden from view by flowery ornaments. One of the greatest features in the lighting are seventy-eight single lights arranged around the first balcony, from the ornamental trustees of the decorations. The same arrangement is placed under the several galleries. The effect is charming; abundance of light is produced, but does not dazzle the eyes, as the flood of light comes from the lines.

The grand centre-piece is brilliantly lighted by numerous bunches of three lights each, set in flowery designs. In connection with the lighting of the stage is an arrangement entirely new; at the back of the footlights by a simple movement of a lever different colored lights can be thrown

on the stage. Every room and corner has its electric light, and all so arranged that, by a single movement of the switch-board on the stage, where are placed thirteen switches, the house and stage may be cut up into sections of lights on or off, either separately or collectively.

This great soft light is agreeable to the eye, being perfectly steady, while the comfort of the audience is enhanced, as the air of the theatre is not vitiated or heated. The Edison people are constantly making improvements, and we are surprised that their light is not adopted in every theatre in the land.

### THE EDISON LIGHT ON THE STEAMER "CITY OF WORCESTER."

The following correspondence explains itself:

DETROIT AND CLEVELAND STEAM NAVIGATION CO.,

C. D. WATKINS, General Passenger and Ticket Agent.

DETROIT, JULY 11, 1883.

MR. JOHN R. MARBLE, Mgr., Edison Electric Light Co., Detroit, Mich.:

DEAR SIR—In considering the subject of lighting our new steamer with the Edison System, our General Manager was informed by an old steamboat man from the Long Island Sound, that the steamer "City of Worcester" had made a failure in her trial of the Edison System. Knowing what I do of the System I could not believe it, and I induced our General Manager, Mr. Carter, to correspond with the Manager, Mr. Gardner, of the Norwich and New York Transportation Co., and inquire for himself, and it is with great pleasure and satisfaction that I enclose the reply he received. All these lines of proof should have their weight with those who have been educated in the wrong direction, and found their mistake too late.

Yours truly,

C. D. WHITCOMB,

G. P. & T. A.

### SUPERINTENDENT'S OFFICE.

NORWICH & NEW YORK TRANSPORTATION CO.

NEW LONDON, CT., July 10, 1883.

MR. D. CARTER, Genl. Mgr., Detroit & Cleveland Steam Navigation Co., Detroit, Mich.:

DEAR SIR—Answering yours of the 23 inst., respecting our experience with the Incandescent Electric Light for lighting steamships, will say, that our iron steamer "City of Worcester," 2,500 tons measurement, is lighted with the Edison system. We have about 600 lamps altogether, and the power is furnished from our main boilers. The plant is run by two Arrington & Shaw 10 by 12 engines, and gives entire satisfaction. Without question it is the safest manner with which we can light, and as we run it with power from our main boilers I think it is as economical as anything else we can use. The only expense is the replacing of the lamps (they burn on the average 300 hours) and repairs to the Dynamo, which for past 18 months in our case has been very small.

We also have oil lamps, but I put them in when I built the steamer, nearly four years ago. If I had the same thing to do again I should not do it, as they are not necessary.

Our steamer is wired off into a dozen different sections, each independent of each other, and controlled by a switch-board set up in some safe place where it will be free from accident or collision when the wires may be cut by the blow, only a small part of the boat will be in darkness. Our engines are also connected with our Dockley boiler, so you can run our plant from that source. I should be sure and have a boiler with capacity enough to both heat the boat and run the electric engine, if I was building a new steamer, as you could, on a pinch, run the plant if you wished to without using your main boiler.

We light all our steamships, in fact our whole fleet. We offset the expense of electric engine by carrying less porters to take care of oil lamps. Our electric engine runs when working up to full power, 500 revolutions per minute, and the Dynamo's 600 per minute.

Yours truly,

S. A. GARDNER,

Supt.

### STREET LIGHTING.

The Edison Electric Illuminating Company of Lawrence (Mass.) have just closed a contract for lighting the streets

in the entire City of Lawrence, replacing 592 gas and oil lamps now erected within the city limits, besides erecting 25 additional lights at such places as the city government may designate. The contract is made for a period of five years, and provides that the company shall retain control of the wire and other property placed by them, and shall light and extinguish the lamps, and maintain the same without additional charge to the city. The price to be paid to the Lawrence Company is \$550 per month. The Lawrence Gas Company instituted a vigorous opposition, their price being \$50 below that of the Edison Company, and their tender embracing additional inducements to the city; 150 of the lamps were to be provided with 4-foot burners, and the balance with 3-foot burners. The gas company's bid was \$200 per month.

The Aldermen, without a dissenting vote, agreed to accept the proposition of the Edison Company, and the Common Council concurred unanimously.

Although the Lawrence Company is selling the light to private consumers at a price equal to gas at \$1.70 per thousand feet, they are earning and paying regular dividends at the rate of six per cent. per annum, besides accumulating a surplus, notwithstanding the low price they are obtaining for their product. Their energy and good management are very much to be commended. Besides selling the current for lighting, they have connected with their station some 20 motors; they are supplying current for the regulation of clocks, and their exhaust steam is sold for heating and other purposes.

EDWARD H. JOHNSON,  
President.

No. 8.

## BULLETIN FOR AGENTS.

THE EDISON COMPANY FOR ISOLATED LIGHTING.

65 FIFTH AVENUE.

NEW YORK, SEPTEMBER 15, 1885.

### EDISON LIGHT IN CANADA.

One hundred and fifty Edison lamps were recently installed in the offices of the Great Northwestern Telegraph Company in Montreal. The General Manager of the company in Toronto, in writing to a friend in New York, under date of August 20th, encloses telegram received from Montreal as follows:

How lamps worked like a charm all last night. Will arrange to keep machinery going night and day soon.

The following is an extract from the letter enclosing the above telegram:

Toronto, Ont., Aug. 20th, 1885.

DEAR SIR—Enclosed message about our Edison lights in Montreal office just started, with our satisfactory experience in Toronto and this in Montreal offering a saving of at least half our expense in lighting these important offices, the marvel to me greater than ever that the system is

not more generally adopted. There must be some reason for this which is not apparent. We have now had the lights here in operation over six months and only three lamps have given out from natural causes and had to be replaced in our operating room, where, as you know, they are used such long hours. I confidently expect our Montreal experience will be equally satisfactory. My own confident anticipations have so far been more than realized.

#### THE BRUSH-SWAN INCANDESCENT SYSTEM PROVES A FAILURE.

In October, 1884, under authority from the Board of Public Works of the City of Cincinnati, the Superintendent of the Water Works Department advertised for proposals to light the Front Street Pumping Works with incandescent electric light. In response to the advertisement four bids were received. The Brush Electric Light Co., being the lowest bidder, their bid being \$8,029 for a 100-20 C. P. incandescent electric light plant, was awarded the contract.

They installed the plant and turned on the light about November 15th, subject to a trial of ninety days.

The following article appeared in the "Cincinnati Enquirer," February 16th, 1885:

#### BOARD OF PUBLIC WORKS.

A Gas Meter that Faithfully Records the Same, whether Gas is Used or Not.

The Brush Electric Light Company sent in a bill for one 100-light incandescent plant placed in the Front street pumping-house for \$8,029.

Accompanying this was a communication calling attention to the fact of the expiration on the 15th inst. of the ninety days' lighting of the pumping-house.

The proposition of the company, dated October 25th, under which the Electric Light Company put in the plant, is as follows: "We will furnish

a plant for 150 incandescent light of 50-candle power each, including dynamo, lamps, engine and fixtures for same for the sum of \$8,029, the City Water Works to furnish steam to the engine and furnish all plying from boiler to engine, as well as the exhaust and waste pipes; and, further, all oil; attendance and cartons necessary to operate the plant during the ninety days' trial."

One item of the specifications under which the proposal was made provides: "If at the expiration of the ninety days' trial the work and lighting shall be unsatisfactory to the Superintendent of the Water Works, the apparatus must be taken out and all fixtures disturbed be returned to the original condition, without expense to the city."

Superintendent Bush was interrogated as to the incandescent light. He affirmed that, although the gas supply was shut off during the past month, except for two nights, when the electric machinery was out of repair, the gas bill for the current month was as high as ever, \$5,000 feet. The meter faithfully recorded its 55,000 feet per month, as heretofore. He did not believe it would pay to burn electric lights, especially if the gas bill runs up the same whether gas is used or not.

The whole matter was referred to the Water Works Committee in connection with Superintendent Bush. The bill of \$8,029 is equal to the cost of lighting the pumping-house by gas for three years. The Water Works Committee at the afternoon session decided to recommend the removal of the plant.

On the same day the "Commercial Gazette" says:

#### Board of Public Works.

Expensive Plant for an Unsatisfactory Light—Electricity and Gas Very Harmonious.

The Brush Electric Light Company sent in a modest little bill yesterday morning for \$8,029 for an incandescent plant of 150 lights on ninety days' trial, according to contract. Their letter says: "Your early consideration of this matter would place us under obligations. Please inform us when we shall discontinue the service of these in charge of the installation at the present time." Doubtless the \$8,029 paid down would be very obliging, but it was not paid. The matter was referred to the Committee on Water Works in connection with the Superintendent, whose certificate that the light is satisfactory is necessary. Besides, the contract was that the company should put the plant in as an experiment, which, if not satisfactory, will be removed, and nothing paid. Mr. Bush, Superintendent of Water Works, was sent for, and stated the above facts; also, that he does



not believe that it will pay the department to use the electric light. No contract was made with the company. He also stated that the gas bill was not reduced by reason of the electric light, but could not account for it, except that perhaps something was the matter with the meter. Gas, he said, was only used two nights. The proposition of the Brush Company says that "it is understood that the City Water Works agree to furnish steam to the engine at a pressure of not less than ninety-five pounds, and to furnish and connect all piping from boiler to engine, as well as the exhaust and waste pipes from engine; and further, that all oil, attendance and carbons necessary to operate the plant during the ninety days' trial to be supplied and paid for by the City Water Works." All this was complied with, but no estimate or statement of expenses incurred thereby has been submitted, by which to judge the actual cost.

Section 7 of the specifications under which the proposition was made reads that, "If at the expiration of the ninety days' trial the work and lighting shall be unsatisfactory to the Superintendent of the Water Works, the apparatus must be taken out, and all fixtures disturbed be returned to the original condition without expense to the City of Cincinnati or detrimental to the working of the Water Department, and the contractor will hold the city harmless for the use of said apparatus or damages thereto."

The Water Works Committee of the Board of Public Works, to which the matter was referred, after hearing the arguments of the Brush Company, decided to give them another 30 days' trial.

The following is the report of the Superintendent of the Water Works, made upon the expiration of the 30 days' additional trial granted by the Board:

CINCINNATI, March 23d, 1885.

TO THE HONORABLE BOARD OF PUBLIC WORKS:

GENTLEMEN—On September 8th, 1884, Superintendent Bell asked for the privilege of advertising for propositions to light the Front street pumping works by either arc or incandescent electric light, and he goes on to say this kind of light would be "exceptionally beneficial and a desirable and cheaper substitute for gas and candles for the pump and pump wells.

Your board thereupon had specifications prepared, and advertised for bids. The specifications contain ten sections. The seventh section is

the only one of importance in connection with this communication, and this recites:

"If at the expiration of ninety days' trial the work and lighting shall be unsatisfactory to the Superintendent of the Waterworks, the apparatus must be taken out and all the fixtures disturbed be returned to the original condition without expense to the City of Cincinnati or detrimental to the working of the Water Department, and the contractor will hold the city harmless for the use of said apparatus or damage thereto."

In response to the advertisement for proposals four bids were received, varying from \$4,557 to \$8,020. These were referred to the Superintendent for report, and he recommended that the work be awarded to the Brush Electric Light Company at their bid of \$8,020. Their proposal states:

"We will furnish a plant for 150 incandescent lights of twenty candle-power each, including dynamo, lamps, engine and fixtures for same; the brackets for incandescent lamps being arranged to attach to prevent gas, fixtures and chandeliers, for the sum of \$8,020; and further, that oil, attendance and carbons necessary to operate the plant during ninety days' trial to be supplied and paid for by the City Water Works."

I have not been able to find any other written instruments between the city and the Brush Electric Light Company other than the specifications and the proposal of the company.

The Brush Electric Light Company put in the apparatus, and during the ninety days' test furnished the attendance. At the expiration of the time I expressed my dissatisfaction on account of its not being economical and unsuitable. One thing I did not mention, and that was its unreliability; during the ninety days' trial it failed twelve times, and gas had to be used.

Upon the receipt of my report, and after hearing the arguments of the Brush Electric Light Company, your board permitted an additional thirty days' trial. During this time gas was turned off at the meter, and the dynamo was run continuously for twenty-four hours per diem, and it failed four times. To test the brilliancy of the light, Prof. French, of the University, was employed. He tested twelve lamps, and found the average to be  $1\frac{1}{2}$  candle-power, this being  $\frac{1}{2}$  candle power less than that mentioned in the proposal of the successful bidder, which calls for 150 lamps of twenty candle-power each.

I think it can be demonstrated that while a new lamp may show a light of fifteen candle-power, it gradually deteriorates, and long before it is entirely burned out it will show a power of only half or one-third of the original light. But it is to the expense of operating the light I wish to call your particular attention. It has been stated that as there is a large amount of steam used, and as there is a large force of employees, cost of steam and attendance is immaterial, and should not be considered in calculating the

cost of the electric light. Let us examine these statements. It requires a ton of coal per day to run the engine producing the electricity, and it costs at least \$3 by the time it is placed under the boilers.

The only class of employees that are steadily employed during the twenty-four hours are engineers, firemen, coal wheelers and coal weighers, and these constitute a force of forty men. It would be folly to attempt to divide the responsibility of the light among so many men, expecting each man to give a little of his spare time to watching the engine or replacing the lamps. To make the light a success, two attendants would have to be provided, one to run the machine at day and the other at night, it being necessary to have a light continuously for twenty-four hours.

The cost of the light for one year would then be as follows:

Coal for one year, 365 tons, at \$3 per ton.....	\$1,095 00
Oil " " " 157 gallons, at 50c. per gallon.....	80 00
Renewal of 30 lamps 9 times—270 lamps	
" " 120 " 2 times—240 "	

Total renewals, 510 " " at 50c.....	430 00
Two attendants for one year, at \$50 per month.....	1,440 00
Interest on \$5,020, at 6 per cent.....	181 74

Total cost of the light for one year.....\$3,144 24

In 1884 the cost of gas for one year was \$1,300, and the electric light would thus cost more than twice as much gas.

The light is therefore unsatisfactory to me on account of its uneconomicality, and further on account of its expense.

Yours truly,

WM. H. DOELL.

After hearing the report, Mr. Springmeier moved that the Jewish Electric Light Company be notified to remove its plant. Mr. Springmeier said that the reason he made the motion was that it was upon his motion the test was extended thirty days, which only served to show the correctness of the first report of the Superintendent against the plant as unsatisfactory. The motion was carried by a unanimous vote of the board.

The Spring Garden and Belmont Water Works, Phila., have been successfully lighted for the past two years by the Edison light.

## NEWSPAPER COMMENTS.

The following interesting editorial from the columns of the "New York Herald" of September 7th will speak for itself. It is needless to state that this notice was entirely unmodified by us:

### Incandescent Lamps.

The elaborate scheme for testing the duration of life of incandescent lamps by a special committee of the Franklin Institute at Philadelphia has been carried out, and the results have been made public. The committee report in detail the methods of making the tests, the pains taken to avoid error and the data from which the relative economic value of each lamp determined. The history and behavior of each lamp under test are given for a period extending from April 11 to May 28, during which the current was continuously supplied to those lamps that stood the time test. From the Philadelphia "Ledger's" reprint of the data it appears that the observations were made with such accuracy that the presence of a widespread magnetic storm, of which there were no other indications, was disclosed by the records kept of the minute power of the lamps in relation to the current. Six years ago Mr. Edison claimed that some of his lamps lasted twelve hundred hours, and that he could guarantee an average life of six hundred hours. The "Ledger," referring to this claim, says:

It is interesting to note as a result of these tests that Mr. Edison has closely adhered to his ten programme, and that the average "life" of his lamps has been prolonged beyond one thousand hours. The current required in volts was about 87, the mean candle power (approximately) was 18.47, and all but one of twenty lamps survived at the close of a test lasting 1,063 hours. One general result of the trial is to clearly settle the fact that incandescent lamps can be made to give the candle power claimed for them, and to last the number of hours which are required in order to enable them to compete in cost with gas.

Although as much has been said for rivals of the Edison lamp, it is very doubtful if any incandescent light can yet be furnished so cheaply as gas under exceptional circumstances. But from the fact that the incandescent lamp does not vitiate the air of our apartments or heat them up in summer, while it is generally reliable and cannot be blown out, it certainly has its advantages. It is to be currently hoped that inventors may soon find some way of cheapening incandescent lamps, and that we may see hereafter the healthy competition with gas put upon a sure footing in every large community.

The best answer to the doubt expressed in the above article as to the cheapness of the incandescent system is the fact that in Harrisburgh, Penn., the Edison local company is selling the light at an equivalent of about \$2.00 per thousand feet for gas, in a comparatively small city, with only an exceedingly small proportion of the light consumers connected, and under these conditions is earning dividends at the rate of more than 20 per cent. on its capital stock.

The following is an editorial from the "Argus," Jersey City, N. J., of August 21st, 1885:

#### Incandescent Lamps.

The September number of the "Franklin Institute Journal" contains as a supplement the report on the efficiency and duration of incandescent lamps, made by a special committee, which was engaged for many weeks in a series of exhaustive tests. The report, which is fully illustrated, fills over one hundred pages of the magazine, and is the most important and valuable recent publication by the Institute. Every detail of the methods of making the tests is described, so that the reader, if a practical electrician, can determine for himself whether the measurements and calculations have been reached by instruments and rules of procedure free from risk of error. The tables giving observed results are also very elaborate and show the great care taken by the committee to collect the data from which to determine the economic value of the several lamps. The committee, however, makes no comments, confining itself to a clear description of observed facts, and leaving the reader to draw his own conclusions. Besides the general results shown in the report, the history of each lamp under test is given for a period extending from April 8th to May 28th, during which time the current was continuously supplied to those that survived the time test. Observations were made daily, and with such accuracy and care that the presence of a widespread magnetic storm, of which there were no other indications, was disclosed by the records kept of the candle power of the lamps in relation to the current. The presence of a magnetic variation accounting for the observed fluctuation was afterwards confirmed by reports from far distant magnetic observatories. Of the particular results obtained no summary can well be made, but one fact is worth noting. Six years ago, when the first account of the Edison carbon filament lamp was published, the inventor declared as his purpose to make a lamp of high resistance, giving a light of sixteen candle power,

and requiring a current of about 160 volts. At that early day Mr. Edison claimed that some of his lamps lasted 1,000 hours, and that he could guarantee an average life of 600 hours. It is interesting to note, as a result of these tests, that Mr. Edison has closely adhered to his then programme, and that the average "life" of his lamps has been prolonged beyond 1,000 hours. The current required in volts was about 97, the mean candle power (spherical) was 15.47, and all but one of twenty lamps survived at the close of a test lasting 1,065 hours. One general result of the trial is to clearly settle the fact that incandescent lamps can be made to give the candle power claimed for them and to last the number of hours which are required in order to enable them to compete in cost with gas.

The "Times," Reading, Pa., August 23d, 1885, prints the following editorial:

Six years ago, when Edison made known his invention of the carbon filament lamp, he declared as his purpose to make a lamp of high resistance, giving a light of sixteen candle power. At an early day Mr. Edison claimed that some of his lamps lasted twelve hundred hours, and that he could guarantee an average life of six hundred hours. It is interesting to note, as a result of these tests, that Mr. Edison has closely adhered to his then programme, and that the average "life" of his lamps has been prolonged beyond one thousand hours. The mean candle power (spherical) was 15.47, and all but one of twenty lamps survived at the close of a test lasting ten hundred and sixty-five hours. One general result of the trial is to clearly settle the fact that incandescent lamps can be made to give the candle power claimed for them and to last the number of hours which are required in order to enable them to compete in cost with gas.

The electric light company in this city is giving an exhibition of the Edison lamp with the prospect of its taking the place of the arc light in stores and private homes. The company deserves the patronage of the public, and when it is ascertained that the Edison lamp is not more expensive than gas, it will not be long before this light will be in general use.

#### LONG LIFE OF LAMPS.

We have received from the Bureau of Navigation, Washington, a copy of the official report of the operation of the

Edison plant on the United States steamer "Trenton," showing the average life of 10 and 16-candle power lamps for the quarter ending June 30th, 1885, to have been 1,164 hours by actual count. The maximum life of any one lamp was found in a 10-candle lamp, which lasted 4,335 hours of actual burning. During this quarter the plant was in operation eighty-two days, averaging twelve hours and six minutes per day, and since September 18th, 1883, the plant has been operated 8,395½ hours, or 349 days 19½ hours. Of the lamps broken, eight were broken through carelessness of the crew. The report further states that no lamps were broken by reason of the jar during target practice. This is a contingency that has been found very difficult to provide against, but the best evidence of our success in this direction is the report quoted above.

#### STREET-LIGHTING.

The local Edison Illuminating Company, in West Chester, Pa., are about completing their station, and have just succeeded in making a contract with the municipal authorities for lighting the streets of that town, with 16-candle lamps. This contract was secured in spite of the bitterest opposition from the Gas Company, during which the latter refused their bid about fifty per cent. from their former price, which former price they had always claimed to be as low as it was possible for them to supply the gas without incurring financial loss. One of the councilmen of West Chester wrote to the Chief Burgess of Bellefonte, Pa., asking information in regard to the success of lighting the streets of Bellefonte by incandescent lamps, and received the following letter in reply:

BELLEFONTE, Pa., August 25th.

MARSHALL S. WAT, Esq., West Chester, Pa.:

DEAR SIR—Our Chief Burgess has handed you a letter of the 23d inst., and I will give you what information I can in regard to our street lighting with much pleasure. We are now using the Edison light on our streets with great satisfaction. For twenty-five years or more we have had gas on the main streets and in the central part of the town and kerowee oil lamps on the outskirts. Our town is small, only having a population of 4,000, but the town is built anything but compactly, and covers a great deal of ground—the cost, however, of putting up the system to take the place of both gas and kerowee lamps was very small to the Electric Light Company. We had quite a contest in the town council when the question of lighting the streets with electric light was presented, several members being Gas Company stockholders, but the Edison Company was so much below the Gas Company when the bids were opened that there was no question which was the cheapest. We had forty-two gas lights and thirty-four kerowees. The Gas Company's rate for gas is \$2 per thousand feet, and they offered incandescent the coal oil lamps light and extinguish them, continue the gas-lamps light and extinguish them from dark until twelve o'clock at night, on dark nights (i.e., when there was no moon) for the sum of \$1,212. The Electric Company offered to replace all lights, both gas and kerowee, with electric lights, and light every night in the year from dark until one o'clock in the morning, for the sum of \$1,212, furnishing sixteen lights of 16-candle power, twenty-two lights of 15-candle power, and twenty-four lights of 10-candle power—they putting in the system, operating it and keeping it in repair, and placing the lights wherever the Street Commissioner and the Council should direct. We placed the lights, however, in most cases on (not in) the old lamp posts and gas posts, taking the tops of the lamps off and putting light with shade about three feet higher than the post on an iron bracket. The citizens are much pleased with the light, and our town is much better lighted than ever before. If we were to make another contract, we would probably have all lights 50 and 16-candle power—20s for central part of town and 10s for outskirts. Any further information you may wish I will be glad to give. I might send you a newspaper with a copy of the agreement between the borough and Electric Company if you wish it. Of course the lights are all operated by a switch at the station, and all turned on or off at pleasure in a second's time, thus dispensing with men for lamp-lighters, which you have to have with gas or coal oil.

Yours truly,

LAURENCE BROWN,  
Chairman of Street Committee.

There may be a slight variation in the number of candle power to different lights I named, as I gave it from memory, but the difference is very little, if any. The contract may call for twenty-eight 10's and eighteen 10's instead of twenty-four 10's and twenty-two 10's.

It is by practical experience of this character that are lights are gradually being displaced even in streets where they have generally been supposed to occupy an undisputed field. In the several cities where the streets are now lighted by the Edison incandescent lamp it has been proved beyond all possibility of doubt that the better distribution obtained by the use of the Edison lamp insures far greater economy than with arc lighting, and owing to the facility with which the lamps are controlled, they are even cheaper than gas.

#### RELIABILITY OF EDISON CENTRAL STATIONS.

An erroneous impression seems to prevail that it is impossible to place the same dependence upon the incandescent light from a central station as is generally placed upon a supply of gas from an ordinary gas works. An intelligent examination of statistics of gas companies will satisfy any one that the reverse is the case. In almost every small city or town it is a well-known fact that the supply of gas occasionally gives out from one cause or another, and even in this city, before the advent of electric lighting, large newspaper concerns and others similarly circumstanced, have always kept a supply of tallow candles to serve in case of a failure of gas. Some years ago the supply of gas in New York did fail one night, and the New York "Herald" appeared as usual the following morning, having previously supplied itself with candles.

An Edison station, on the other hand, is as nearly infallible in respect of reliability as human knowledge and fore-

sight can possibly make it, if installed on the principles laid down by this company. A knowledge of this fact is gradually but surely inspiring confidence in the mind of the public where the Edison central station system exists, and consumers who formerly were afraid to give up their gas for want of confidence in the continual supply of electricity now recommend its reliability, and their objections are overcome.

The following item from the Troy "Times," of September 7th, disproves the generally supposed infallibility of a gas plant, even in so large a city as Troy:

The gas was suddenly extinguished in many stores in the city on Saturday night. Some storekeepers used very emphatic language, and the blue streaks served for illuminating purposes until the supply of hydrogen was sufficient to permit the transaction of business.

Not alone does an Edison central station prove its reliability in furnishing current for lighting, but for motive power and other uses it is equally satisfactory, as the following extract from the Lawrence "Daily American" of July 8th, 1885, shows:

#### Printing by Electricity.

One year ago the Edison Electric Light Company placed in the "American" office one of their motors, and connected it with their works on Common street. The big belt was removed from the driving wheel of our steam engine and put upon the little electric motor, and the entire power to drive all the newspaper, book and job presses, elevator, etc., of the "American" has since been uninterruptedly furnished by electricity. The fire then permitted to go out under the steam boiler have not since been relighted, nor has there been the slightest loss or suspension of the full power required from that day to this.

The "American" was the first daily newspaper in the world to be printed by electricity, and, after a year's trial, we consider it the most unvarying and satisfactory power we have ever used.

## ELECTRICITY IN THEATRES. How it is Taking the Place of Gas.

What Managers who Use the New Light Say of Its-General Satisfaction  
Expressed.

The following is a reprint from the New York "Tribune" of September, 1884 :

Fifty-three million cubic feet of gas are annually burned in about thirty of the largest theatres and concert halls of New York. Though so few in number compared with the great body of gas consumers, who number nearly 125,000, they are as a class more profitable than any other on the books of the six city companies. They contribute over one per cent. of the entire gross annual revenues to the profits of the companies, while the expense of inspection and collection is very small.

The temporary employment of incense oil lamps the other evening in an east side theatre to check electric lights supplied from storage batteries, directs attention to a new class of lights in connection with this subject. Although the collapse and removal of storage batteries from the only two theatres in this city that employed them have justified all the prophecies of their early opponents, the direct system of electric lighting is being rapidly introduced into theatres, and is a formidable rival to gas. One company alone has in use over ten thousand incandescent lamps in the largest theatres and opera-houses of Europe, and in the United States within a year has put sixteen thousand more in places of amusement outside of New York. The managers of the principal theatres here have until this season contented themselves with gaillard. Each house employs its own gas engineer, who has entire charge of the lighting-department. The cost of lighting during the season of forty weeks varies from \$75 to \$450 a week according to the size of the house and the character of the plays produced. Theatres that are open the year round, like the Casino and the Madison Square, have proportionately greater bills to pay. The roof gardens at the Casino figures largely in the lighting account of that house. To the cost of the gas and the necessary labor must be added that of the calcium light, which no first-class theatre is without. The average cost of lighting will probably exceed \$4,000 a year in most theatres of this city.

### AT THE NEW MUSEE.

Site of the largest consumers of gas in this field have adopted electrically, all but two within a comparatively short time. A large number of electric lights at the Eden Musee has been in continuous use for six

months. J. G. Suter, the business manager, said yesterday to a "Tribune" reporter: "On the score of safety and comfort the light speaks for itself. We have 540 lamps in use twelve hours a day, every day in the week. From careful calculations I estimate that this is equivalent to a daily consumption of 22,000 cubic feet of gas. Imagine the effect on the atmosphere and decorations of this room of so great a fire kept continuously burning and giving off, besides heat, waste products in the shape of water, sulphur, ammonia and carbonic acid. See, too, with what inferiority these little globes lend themselves to the display of our various tableaux. By enveloping them in tissue paper of different shades and disposing them at the desired angle we get the height of realistic effect, without shadows. We used gas at first, and endeavored to convey the light in the same way by means of rubber tubes, but the fire authorities interfered and made us remove the tubing, which was, after all, not suitable to our purpose."

"But would it not be much cheaper to use gas from the street mains than it is to manufacture your own light?"

"You shall see. We have a fifty-horse power engine run by our own engineer. Here is the daily expense account rendered for the first six months. I have computed interest and depreciation on plant at six and ten per cent. respectively: Coal, \$6; labor, \$4; lamps reserved, \$1; interest and depreciation, \$2.57; oil, \$1; total, \$14.12. This is equivalent to gas by my former estimate at sixty-three cents per 1,000 cubic feet. In other words, the same amount of light would cost us at present prices for gas, over \$50 a day."

NOTE: This is an Edison plant.

At Koster & Bial's Concert Hall, 240 electric lights have recently taken the place of gas. A ventilating fan in the vestibule is run by an electric motor, the power being furnished by a current sufficient to light a 16-candle lamp. Mr. Bial said: "Our gas bills have sometimes exceeded \$900 a week. This inferior freezing, hangings and everything have been literally burned out every year by the gas consumed to light it. The difference in temperature is very noticeable since we turned on the electric light. I think the cost is about one-third less than gas supplied by the Municipal Company. But there would be economy in using it even if it came much higher."

NOTE: This is an Edison plant.

## EXPERIENCE OF EAST-RIDE THEATRE.

A visit to the theatres on the East Side and conversations with several managers show a remarkable unanimity of opinion as to the advantages of electric illumination. The manager of the National Theatre said:

"I put in the electric light this season, and I wonder now how I could ever have got along without it. There is nothing in the way of second effect of which gas is capable that cannot be done more easily and satisfactorily by electricity. Yes, the theatre is better lighted and at less expenses."

**NOTE.** This is an Edison plant.

The reporter found Harry Miner at the People's Theatre. In response to inquiries on the subject he said: "I shall have the light in both my houses on this avenue within a short time. Estimates are now in preparation. It is the only light for the purpose, and infinitely superior to its older rivals. My lower house has been lighted from an arc-light station in Stanton street. It has cost me by this system probably fifty dollars a week more than for gas, but on the whole it was worth the additional expense. I propose in future to manufacture my own light and supply both houses from the same station. By this means I am convinced that I can make the light for half what it now costs me."

"You have had several fires, I am told, Mr. Miner, which the authorities attribute to the system of lighting in use in your theatre."

"Yes, that is so. But I prefer not to say anything on that head at present. It would involve a discussion of the relative merits of rival systems. I have my own opinion, however, on the subject, bought by experience, and when I carry out my new plan of lighting, I don't think you will hear of any fire caused by it. There is absolutely no danger from a proper system of electric light, while the presence of gas in a theatre is a constant terror to the proprietor."

**NOTE.** The electric light above referred to by Mr. Miner was that of the United States Electric Lighting Co. (so called Weston system). Since that time Mr. Miner has shown his business sagacity by having his three New York theatres satisfactorily lighted by upwards of fifteen hundred Edison lamps.

At the Third Avenue Theatre a series of experiments with a system of electric lighting from storage batteries have been in progress for over a

year. They terminated abruptly on Saturday night a few weeks ago. For forty-eight hours there was no light or means of furnishing it in the theatre, gas fixtures not having been put in when it was built. By working night and day with a large force of men a direct system of electric lighting was arranged with five hundred lamps, engines and dynamos, in time to light the house for Monday evening's performance. "We have no fault to find with the light we are getting now," said Mr. Arthur, the manager for Mr. Rankin. "You observe that it is raised or lowered at will in the auditorium and that the stage effects are such as could not be obtained by a less steady and brilliant illumination."

"Do the actors complain of the difficulty of making up by the electric light?"

"I never heard of that except where the theatre was lighted with gas and electricity at the same time. The advantages of light without heat in a small dressing-room would certainly offset any such objection."

**NOTE.** The Third Avenue Theatre is another instance of the folly of dealing with experimenting electric lighting companies. It is now lighted successfully by an Edison plant.

The last manager seen was Mr. Kinsley at the Star Theatre, during the performance of "Sicilia." "The electric light," he said, "I have now used on the stage in the transformation scene. There is no limit to the startling and dazzling effects that may be produced by such means. If every theatre that we went to had it I would not be obliged to carry my electric light machine about the country with me. But it is only a question of time when they must all use it. It is the first step that costs. After that there is no question but that it is cheaper than gas in every way."

**NOTE.** This refers to an Edison plant.

The St. Louis Daily Globe-Democrat of September 8th, 1885, prints the following regarding the lighting of Popo's Theatre in St. Louis, Mo., by the Edison system:

This house has been carefully overhauled and, to considerable extent, refitted. The Edison incandescent electric light has been added, and the arrangements for adjusting the brilliancy and power so perfected that the finest conceivable effects are secured both on the stage and in the auditoriums. Between the acts, during the unsalted blaze of light, one could easily imagine the full moon to have peeped in for a glance at the

fair faces and fiery of her sex, to such signal advantage do they appear in the mellow and all-pervading glow. About six hundred burners are in place, under the balconies, in the boxes, across the stage and in the great chandelier. The heat and vitiated atmosphere often incident to gas-burn 'ng are not felt, and the audience being steadily and carefully tempered, the effect is exceedingly grateful to the sight, rendering features and decorations distinct and well defined.

#### THE FIRST BOHEMIAN THEATRE LIGHTED BY ELECTRICITY.

The Bohemian National Theatre, Prague, is in true Renaissance style. Its cost was 3,100,000 florins. It is a model theatre. The arrangements for the prevention of fire and for the safety of the audience in case of such an event are perfect. The Ring Theatre catastrophe in Vienna and the burning of this theatre to the ground when first completed, in 1881, made the necessity of such precaution very evident. The frame work, roof, and stags are entirely of iron. The floor and some parts of the scenery are of wood, but these are rendered as nearly fireproof as possible by saturation with fireproof material. The stage is provided with an iron curtain consisting of two parts, the one half descending and the other rising, thus making its manipulation more rapid. This curtain is rolled up from various parts of the house by machinery. The stage machinery occupies three stories below the stage. The theatre is heated by steam. Its ventilation is perfect. It is lighted by the Edison electric lamp. There are in all 2,500 lights large and small. One row of lights is worth noting. There are apparently 150 large pearls set in filigree gold round the ceiling. The half transparent glass has a perfect pearl cut. In case of fire the whole stage can be flooded from above.

#### THE DURABILITY OF DYNAMOS.

The subject of the life of a dynamo for electric lighting purposes, has been frequently brought to our attention by many who are anxious to see the electric light at their mills or works, but have been deterred from incurring the expense of an installation by the absurdly incorrect statements made, and often accepted, relative to the durability of a dynamo. Its life has been variously given at two years and upwards, an estimate so low as to be sufficiently absurd. If a dynamo be carefully examined, it will be seen that the elements of "wear and tear" are but small. The field-magnets and pole-pieces of solid iron, carefully wound with layers of well insulated wire, present nothing for deterioration. The properly-constructed, well-built "armature" should last without fear of damage, with the exception of such parts as are liable to friction. In the bearings themselves, if properly lubricated, there can be no wear more than in any ordinary engine-bearing, but it is in the "commutator" and the collecting "brushes" that "wear" must go on. We have here the copper brushes pressing against the copper bars of the armature commutator revolving at various speeds, and it is here, where there is a certain amount of friction, that there must not only be a certain loss of material in the brushes, but also in the commutator bars. This loss is certain and definitely small with a good dynamo and one carefully attended to, but with inferior dynamo and lower attention, when "sparking" occurs the brushes are soon worn down, and the bars getting "scored" sooner require being "turned" to get a smooth surface. The sparking of a dynamo must sooner or later ruin a commutator (but it is a considerable advantage to know that you possess a machine whose commutator can be easily replaced), as every spark means more or less metal destroyed.

In a paper recently read on "Electric Lighting for Steamships," it was mentioned that the dynamo on the "Himalaya" had an axle of the Siemens type. It had been running constantly for two years, and had not had any repairs done to the commutator, which might be considered very good wear. Although this question is one of great interest as affecting the "maintenance" of an electric light installation it was not again referred to, but in a recent number of our contemporary, the *Electrical Review*, particulars are given by Mr. Ernest Perry of the first year's cost of the installation at the Prince's Theatre, London, and he remarks that the Siemens dynamo "is in as good condition as when it was first put down, with the exception of the wear on commutator (which, on being measured after 12 months' wear, was found to be  $\frac{1}{16}$  of an inch). The machine has used in that time  $\frac{1}{2}$  pairs of brushes four inches wide." From the number of dynamo we have seen at various times, we should



consider that in this case the "depreciation" of the dynamo and the cost of maintenance above the average. It was only a short time before this case met our attention that we carefully examined a dynamo, which was also used for a theoretical illustration, in order to see what the best had been on the commutator. It was a 350-light Edison machine, and had been constantly running for nearly 25 years, and from the feel of the hand over the commutator, it was almost impossible to perceive that there was any wear. Applying a straight-edge, it was possible to perceive that the surface had been reduced to the extent of the thickness of a piece of writing paper. As regards the brushes, these were the same as originally fitted, and would still last for a longer period. In this machine (running at 920 revolutions per minute) sparking was never observed; the same may be said of the other Edison machines of the same type belonging to the same installation.

The wear and tear of this dynamo was practically almost nil, and granted that it received in the future the same attention it has had in the past, it would be almost impossible to fix the limit when the occasion would have arrived to replace the commutator with a new one. The average life of a dynamo may, therefore, be considered to be at a high figure, provided that due care be taken of the adjustment of the brushes; and its cost of maintenance as that of an occasional pair of brushes, and the removal of the commutator, the cost of which would have to be spread over a number of years.—*Mechanical World*.

#### HOW MACHINERY IS RUINED.

We have again beheld the results of "smart Alex" engineers, those \$10 per week men, who are expected to attend to their employers' horses, sweep up the shop, and what spare time they have attend to their boilers and engines. During the past week we were in one of the Southern cities. The elegant hotel where we picked our teeth was lighted by electricity. One day the "thing" (I cannot bring myself down so low as to dignify my level profession by calling this an engineer) had keyed up his engine without letting the electrician know of it. About an hour after it started, somehow it got tired and stopped. Imagine the effect—house in mourning. Had melted linings of brasses; electrician mad; saw us and asked assist. men; givers; linings changed in a few moments; engine started; enjoyed an evening with electricians; were chums eighteen years ago on a Western railroad; expressed our mind plainly regarding "thing"; no good; am-

player believes that if a man can throw coal he is as good as can be. We have seen engineers around hotels who wear porters and wood sawyers, and the only wonder is that we don't hear of more "Galveston" accidents.  
—*Dallas Journal of Commerce*.

TRAMP.

#### TESTIMONIALS.

Extract from the Second Biennial Report of the Michigan School for the Blind, Lansing, Mich.

Previous to the erection of the new building, the gas used for illuminating purposes was made from gasoline, and possesses some of the good as well as the objectionable properties of ordinary illuminating gas. It was manufactured on the premises by one of the combination gas machines. The limited capacity of the machine, the variation in intensity of the light depending upon the quantity of gas in the burner, its liability to flooding when newly filled, the danger of fire, and its vitiation of the air both common to all kinds of illuminating gas, made it evident that some other means of illumination should be provided for the new buildings in process of erection. Accordingly, a contract was made with the Edison Electric Light Company for a 200-light isolated plant.

The installation of this plant was completed in February, 1881, since which time it has been in successful operation every night. The working of the light has been entirely satisfactory. The points of advantage which it possesses over any kind of gas light are numerous and important. Among them we will mention its great steadiness, its entire freedom from the dangers of fire and the effects of its accidental escape into the room, which attend the use of gas, the absence of carbon, its great cleanliness, its slight heat, and absolute freedom from vitiation of the air. The safety to the person of the current generated by the Edison dynamo is evident from the fact that the conductors at any part of the system, or even the poles of the dynamo, may be grasped by the naked hand without the slightest injury.

The quality of the light differs materially from that of the arc light, with which the public is more familiar. The preponderance of the yellow or limboons rays in its spectrum gives a soft, desirable quality of yellow light, and is in strong contrast with the bluish white rays of the arc light.

The arrangements of this installation are such as to enable us to run this light most economically. The dynamo and engine are placed in the engine-house and are attended by the engineer, or watchman during engine's absence, without extra help or compensation.

We have one boiler on which steam is carried at high pressure for running laundry machinery and steam pumps. Steam from this boiler is used for running the electric light, and the cost is represented by the cost of keeping up the steam during the night run. We have connected the exhaust from the engine into the light-hot main steam pipe of our heating apparatus, on which we carry about five pounds pressure. The result is that sixty pounds pressure drives the electric light engine, and exhausts against five pounds pressure in the heating apparatus, leaving an effective pressure of fifty-five pounds.

As exhaust steam contains the latent heat on which we depend for heating our buildings, only sufficient pressure being carried to force the steam to the remote points of a complicated heating system, we find that more than four-fifths of the heat in the high-pressure boiler becomes available for heating purposes. Under these conditions, it is proper to charge only one-fifth of the cost of fuel for this boiler to the running of the electric light.

We effect a saving in the expense for oil used on all machinery by filtering the oil from the drip cups. This filtered oil is freer from impurities than when first taken from the tank. We have used the same oil more than sixty times over by filtering it each time after being used on the machinery without apparently affecting its lubricating properties.

The cost of running for 5½ hours 66 sixteen-candle power Edison lamps, the average number in use, is as follows:

For 59 lbs. soft coal, at \$5.00 per 2,000 lbs.	\$0 17½
For oil and waste.	02
For leakage of lamps.	01
For wearing of commutator and brushes to make good the warrant of Edison Co.	02
For depreciation of engine to make good the guarantee of manufacturers.	07
Total cost of running 66 16-candle power lamps for 5½ hours, exclusive of interest.	\$0 31½
Interest for one day on investment except wiring of buildings, \$4,234, at 6 per cent. per annum.	71
Cost of running 98 lamps for 5½ hours, including interest.	\$1 02½
Cost of running 98 lamps for one hour, exclusive of interest.	03
Cost of running 98 lamps for one hour, including interest.	18½

<sup>1</sup> By actual weights, 66 pounds of coal is used on this average, but only one-fifth of that amount is charged to electric lighting, for reasons as stated above.

<sup>2</sup> The wiring of the building saves the expense of putting in gas pipes, and is a matter of which there is absolutely no depreciation. For these reasons it is deemed proper not to compute interest on the cost of wiring.

# INSTITUTION FOR THE EDUCATION OF THE DEAF AND DUMB.

SECRETARY'S OFFICE.

JACKSONVILLE, ILL., March 3, 1885.

GEO. H. BLISS, Esq., Genl. Supt., Western Edison Light Co.

MY DEAR SIR:—Replying to your inquiry regarding the use of the Edison light in this institution, I would say: The Edison Incandescent Electric Light has been in use in this institution since September 29th, 1882—seventeen months. I have never known anything made by man to give more nearly perfect satisfaction than this light has done. The light is superb, pleasant to read and write by, and is less trying on the eye than any other artificial light I have ever known. There has been much less trouble from inflamed eyes and ophthalmia experienced among our pupils since the introduction of this light than previously. It makes no smoke, emits no odor, and makes no appreciable amount of heat. It does not consume the oxygen of the apartment where it is used, and consequently does not in the slightest degree vitiate the ventilation or impair its healthfulness. It requires no matches for lighting, and is absolutely incapable of causing fire. In establishments where there are children or other persons not to be trusted with matches, it is one of the best possible safeguards against conflagrations, since a careless or evil-disposed person cannot use it for incendiary purposes.

As we use the exhaust steam from our electric light engine for warming purposes in lieu of the steam, the cost of this light is very little compared to its usefulness and with the cost of other artificial light. This is mainly composed of the cost of lamps consumed (we have lamps still in use that have rendered service since September 29, 1882), the cost of about half a pint of oil a day lubricating the engine and dynamo, and it was not necessary for us to provide any attendance or power beyond that previously required.

For a public institution circumstanced as this is, it is the best and cheapest light in existence.

With much respect, I am

Yours sincerely,

(Signed,) PHILIP G. GILLET,  
Superintendent.

## WARDEN'S OFFICE,

## ADDITIONAL PENITENTIARY,

ANAMONA, IOWA, July 12th 1888.

WESTERN EDISON CO., 63 Wabash Avenue, Chicago, Ill.

GENTLEMEN—Since June 1st we have kept an accurate account of the fuel consumed, by weighing all the fuel used each day. During the month of June we have run our dynamo 30 days, using 143 lamps 29½ hours in the 30 days, consuming for this use 3,281 pounds of coal, with the following result: For 5 days we used the best Southern Illinois coal, running 51½ hours in the 5 days, and using 880 pounds of coal, which gives an average of 77.2 pounds per day, at a cost of \$5.20 per ton, makes the cost per day \$0.14282; or per hour the amount consumed is 67.13 pounds, which, at \$3.70 per ton, gives the cost at \$0.12410. For 16 days we used common Illinois coal, running 151½ hours in the 16 days, and used 1,205 pounds of coal, an average of \$1.75 pounds per day, which, at \$3.70 per ton, gives the cost per day \$0.15079; or per hour the amount of coal used was 85.00 pounds, and the cost per hour \$0.19265. For 9 days we used slack from common Illinois coal, running 8 hours in the 9 days, and used 1,233 pounds of slack, at an average of 171 pounds per day, which at a cost of \$1.95 per ton, makes the average cost per day \$0.16071; or per hour the amount of slack used was 192.125 pounds, and the cost per hour \$0.19732.

## RECAPITULATION.

143 lamps run during the month of June, 1888:	
5 days at \$0.14282.....	\$0.7141
16 days at \$0.15079.....	2.4095
9 days at \$0.16071.....	1.5064
	<u>\$4.7230</u>
Average cost per day.....	<u>\$0.15743</u>
143 lamps run during the month of June, 1888:	
5 days, 1.15 hours per day.....	5.75 hours.
16 days, .384 hours per day.....	10.73 hours.
9 days, .388 hours per day.....	8.00 hours.
	<u>20.50 hours.</u>
142 lamps used 20.5 hours, costs \$4.723, gives 16 cents as the cost per hour for the whole number, and the cost per lamp for one hour.....	<u>\$0.001118</u>
Cost of lamp, \$1.00, life of lamp 100 hours.....	<u>0.001033</u>
Total cost per lamp per hour.....	<u>\$0.002451</u>

We have 220 lamps, which, if all had been used, would have reduced the average cost per lamp. When candles and oil were used, the cost per hour was \$0.21; comparing this with the 16 cents per hour, the cost of electric light, the economy of the latter is readily seen; but the whole advantage or gain is not in the actual cost alone, but the quality of light at present in use is greatly superior to that of candles and oil.

Respectfully yours,

E. A. MARTIN, Warden.

## NEW BEDFORD CORDAGE CO.,

NEW BEDFORD, Mass., April 18, 1885.

Messrs. PAINE &amp; STORCKENY, Agents, Edison Co. for Incandescent Lighting:

GENTLEMEN—Replying to your letter of 17th instant, we have used Edison light in our factory two winters, and it has given us entire satisfaction both in cost and illumination.

Before putting in this plant I investigated several other electric lighting systems. The Edison then seemed best, and I have never had occasion to change my mind.

Yours truly,

J. W. MACOMBER,

(Signed.)

Manager.

## ALBION PAPER CO.,

HOLYOKE, Mass., May 28, 1885.

Messrs. PAINE &amp; STORCKENY, Agents:

GENTS—We have had in use for two years the Edison Incandescent system of lighting, a plant of 150 lamps.

We have had very little trouble with the running of this light, and are well pleased with its economy.

We know from experience that it is much cheaper than gas, gives a better light, and so matches steel.

We think for paper mills this is the best light to use. From the start we have had very little trouble, have never, to writer's knowledge, had to "sit in darkness," from light giving out. We expected to have trouble with

a "new thing," but then for have had as little trouble with this light as with any new work put in our mill.

After deciding to put in this system, we left the whole matter in the hands of your company, and they carried out the contract to our satisfaction, and did as they agreed, and we found that the representations made by the agent of this company were fully lived up to.

Yours truly,

(Signed.)

E. C. TAFT,

Treasurer.

#### COMMANDANT'S OFFICE, U. S. TRAINING STATION.

U. S. S. "New Hampshire."

Newport, R. I., August 18th, 1885.

Mr. J. H. Vail, Gen'l Supt. of the Edison Co.:

Sir—The electric plant at this station, placed by your company last December, has given entire satisfaction.

The "16 candle-power" lamps have in every instance, I believe, far exceeded the length of time for which they were guaranteed.

Yours truly,

A. H. YATES,

Captain U. S. N.,  
Commanding.

BELLEVILLE FALLS, VT., May 25th, 1885.

Messrs. FAIRBANKS & STICKNEY:

GENTS—Your favor of the 23d received. In reply will say we have been using the Edison light in our paper mill for the past six months, and we must say that it works A. 1, in every respect. Like it much better than oil; can't say as to gas, as we never used that in our mill. Have not had any trouble with it since it was put in last December, 1884.

Yours very truly,

(Signed.)

JOHN ROBERTSON & SON.

#### THE EDISON LIGHT AND SUN LIGHT.

The great difference between the sun and artificial light is due to the fact that, of the light emitted from the former about half the quantity of rays are luminous and calorific at the same time, but as regards our artificial light, for ordinary oil the amount of non-luminous, yet calorific rays, is ninety per cent.; for white-hot platinum, ninety-eight per cent.; alcohol flame, ninety-nine per cent.; electric light, eighty per cent.; and gas light, ninety per cent.; while for petroleum and paraffine oil, the amount is ninety-four per cent. It is this large quantity of calorific rays in artificial light which causes fatigue to the eyes; but this inconvenience is almost entirely obviated by intercepting the thermic rays through the glass enclosing the incandescent filament of an Edison lamp. This renders the light soft and agreeable to the eyes.

EDWARD H. JOHNSON,

President.

No. 9.

## BULLETIN FOR AGENTS.

THE EDISON COMPANY FOR ISOLATED LIGHTING.

65 FIFTH AVENUE.

NEW YORK, OCTOBER 16, 1885.

### HOW INFERIOR METHODS RETARD LEGITIMATE ELECTRIC LIGHTING.

In Bulletin No. 8 we printed correspondence relative to the utter failure of the Brush-Swan system at the Cincinnati Water Works. We supplement this with a proposition made by the Ohio Edison Installation Company, showing the difficulty of again opening up negotiations where a bad bargain had been previously effected. This communication has up to date received no reply. The following is a copy:

TO THE BOARD OF PUBLIC WORKS, Cincinnati, O.:

GENTLEMEN—If our information is correct, we understand that the lighting of the Water Works by the incandescent electric light has been adjudged impacticable by the Superintendent, and that gas is regarded as more economical. If the estimates that we have heard of your consumption of gas are correct, viz., about \$1,000 per year, we would respectfully take leave with your honorable Board and the respected Superintendent

both as to the economy and practicability of the incandescent system of lighting.

Without disrespect to others who may be interested in the business, and with as due respect to the judgment of the Superintendent, we assume to say that the Edison system of incandescent electric lighting is the only "system" yet known that can deliver light commercially in competition with gas, that is thoroughly practical and reliable in all cases and under all circumstances—hence, we beg to say that until the Edison system fails to light your works better and cheaper than gas it is not to be considered impracticable. We, therefore, beg leave to offer the following proposition: Our engineers have visited the works, and is satisfied that 75 lights will amply suffice to illuminate the building, etc., and enable the engineers and other employees therein engaged to attend to their respective duties day or night with equal facility. We will furnish and install an Edison electric light plant of 75-light capacity (16 candles each), with automatic regulation, and the power in the shape of a first-class automatic cut-off engine of horse-power sufficient to properly sustain the full number of lights (75) at their normal incandescence at any and all times for the sum of \$2,200.

This plant will consist and be inclusive of the dynamo, automatic regulator, the wiring, safety devices, and all the appurtenances and incidentals to a first-class Edison plant, the engine and foundation for same, the bolting—in fact, everything necessary to the thorough installation of the plant itself, except the piping (supply and exhaust).

We guarantee—and to these terms or clauses we beg note—that the cost to the Water Works Department of running the plant and maintaining the light will not exceed 40 cents per 1,000 cubic feet—gas standard measurement—exclusive of piper.

That with power the cost will not exceed 80-85 cents—about one-half.

(b) Your present expenditure for gas—"Light for light."

That the "time" required in case of the plant will at maximum not exceed 24 hours per day in the 24. It should not exceed an hour.

That the light will be bright, steady, and at all times when called upon "on deck," ready to attend to business and to fill the bill of its requirement.

That the lamps will be 16 candles each in illuminating capacity, and that their life will average 600 hours.

This proposal is presented in the understanding that steam is to be delivered at 80 pounds pressure.

We would be pleased to install the plant as noted herein, and from date of completion allow you to run same 90 days "on the letter of the guarantees." And for this time (90 days) we hereby bind ourselves to pay for every foot of gas consumed at the Water Works by reason of the Edison

plant failing to do its duty. At the expiration of the 90 days, if the plant is in illumination and cost of running has come up in good form and squarely, to its guaranteed worth, then the price to be paid cash. If it has in any guaranteed respect failed, then the plant to be removed at the expense of this company, with no detriment to the property or pocket-book of the Water Works Department.

Respectfully submitted by yours, very truly,

A. STUART, Sec'y.

We append the results of other freely given and unfulfilled guarantees.

Capt. H. Rice, superintendent of the Memphis, Arkansas & Bonola Packet Co., informed our representative that his company contracted with the United States Electric Light Co., for the installation of a plant on the steamer *Will S. Hayes*. The original cost was \$9,500, which sum was increased subsequently to \$9,000. Two years of maintenance and alterations increased the investment to \$10,000. At a recent meeting of the Board of Directors the plant was ordered to be taken out and to be replaced by oil lamps. This is very different to the experience this company had with the Edison system on their steamer *Kate Adams*, which is perfectly satisfactory.

G. Chaffaugin, of Holokom, N. J., manufacturer of silk, purchased about two years ago a United States Electric Light Co.'s plant, under full guarantees, for the purpose of lighting his mill. After two years' trial it was found to work so unsatisfactorily that Mr. Chaffaugin stopped experimenting and purchased an Edison plant of 250 sixteen-candle lamps to displace this highly guaranteed installation.

#### ANOTHER BAD BARGAIN.

Messrs. Mitchell & Sparling, civil and mechanical engineers, Seattle, W. T., desiring to ascertain from the Des

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Moine Electric Light Company their experience with central station lighting, have received the following letter which shows the necessity of dealing with the Edison Electric Light Company only:

S. Z. MITCHELL, Esq., Spokane Falls, W. T.:

DEAR SIR—Yours of the 11th inst. received, and, in reply, would say that we have tried both the "Weston" and the "Edison," and that there is no comparison between them, as we had no means of properly controlling the Weston like the Edison, and it took nearly three times, if not more, copper for isolated work and they have no central station system at all, and the life of the Edison lamp that we got is about 1,000 hours, and we did not get 100 hours out of the Weston.

This seems like a very strong statement, but we have the papers to show for it.

The cost of the Edison plant is much heavier than that of the "Weston," but we are satisfied to get what we did or what we have, as it has given very good satisfaction, and the other did not.

I know from personal visits to places that have both that there is no system now in the market that stands any show with the one we now have, and while I think the patent companies are very high in all their charges, yet I would not recommend any other system to any one, even though I was educated right in the Weston and had all the advantages of their shop for some time, and did little or nothing with the Edison people but to care for this plant.

We began the first of January, 1885, with 200 lights, and we now have 2,600 running and about 700 more contracted for, and that, without any solicitation, since the first of March.

We feel very much encouraged—in fact more so than we are planning to put out two sub-stations this coming spring.

Yours truly,

F. H. WHITING,

Superintendent.

Dated Des Moines, Iowa, Sept. 19, 1885.

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The following correspondence will explain itself:

PILLSBURY MILLS.

MAR. 21, 1885.

Geo. H. BRow, Esq., Gen'l Supt.:

DEAR SIR—I started up the 300 Edison light plant for the Pillsbury Mills at Minneapolis, Minn., on the 2d of March, and every one was highly pleased at the result. After staying there two weeks I failed to find the least dissatisfaction among the men who were working by the light. In the A Mill in particular, where on five floors I had 118 lamps, they were enabled to read and sit out of circuit all the time; the lamps in use on those floors (some thirty lamps), and the men were much better pleased in every way, the floors being much better lighted in all parts than by the arc lamps.

Mr. F. Pillsbury was anxious to do away with the arc lamps entirely, but on one floor where there was both arc and U. S. incandescent lamps the U. S. lamps were unsatisfactory for the men, and in consequence the Brush dynamo is still kept running.

The man in charge of the dynamo cannot say too much in praise of our installation. He says that in every particular our system is superior to their U. S. installation; the contents, switches, lamps, sockets, dynamos and adjustments being far ahead of anything he has seen yet. As he expresses it, "Everything about the United States plant is in a very crude state," which I must say is very true indeed.

Yours truly,

P. H. SODEN.

U. S. INSTALLATION.

MAR. 21, 1885.

Geo. H. BRow, Esq., Gen'l Supt.:

DEAR SIR—While at Minneapolis I found the following to be the condition of things with the United States plant now running in Mill A of C. A. Pillsbury & Co.:

The capacity of the dynamo is said to be 550 incandescent lamps of 16 candles each. There was said to be 500 lamps in circuit. When the plant was first started up, a little over eleven months ago, they had in all fifteen lamps, but have since been running the Weston lamps, so that at present it is a mixed plant.

The candle-power of each lamp is never over 12, and generally runs about 10 candles; a few lamps are giving as low as 6 or 8 candles.

The sockets are their old style hook connection, which proves to be very unsatisfactory, as frequently the hooks break off and the keys also break down, causing a constant expense and trouble. The same is also true about the switches. They get a loose contact on springs, and I have seen several switches completely destroyed, the half of the wooden base being burned up.

The cutouts cause constant trouble by burning out, caused on account of the poor way of making contact. The wire connecting lamps on lamps frequently break off before the lamps burn out, which completely prevents any further use of them. I have taken an order for 8 switches to replace some of those now up, and expect before long they will change the cutouts to our plug system.

They had a "cross" in some of the flexible cord which was supposed to be fire proof, but it burned up some three feet of the cord and started the wood burning. The main cause of the cross was very poor insulation.

The dynamo is constantly sparking and wearing out lots of brushes, and now, after one year's run, a new commutator is needed. There is such a poor arrangement to adjust brushes that it is impossible to get both brushes on each pole just alike. The fact is, their dynamo connections and adjustments are very poor.

The man in charge of the dynamos says that in every particular the Edison dynamo is the best.

Yours truly,

F. H. SODEN.

NOTE.—These plants have since the above date been increased to 500 Edison lights.

#### MODEL CENTRAL STATION.

Copy of a report made by H. W. Leonard for Central Station Promoters, at Toledo, Ohio.

This station has always been held up by the United States Company as one of their best efforts. Pains have been taken to make this a thoroughly reliable report:

This plant had two engines—a slide-valve operating are lamps and a Westinghouse operating incandescent lamps. No means of shifting load

from one engine to the other in case of accident to either; 50 are lamps in circuit. One or light dynamo operating 150 incandescent in multiple series, six groups, 25 lamps in each group, no key descenders, no automatic shunts. Two dynamos for operating incandescent lamps in multiple are, running two separate and entirely distinct circuits. No means of connecting up in case of accident to either machine. One circuit out for five days on one occasion through the burning out of armature. One circuit had 221 lamps connected, the other circuit 175. Mains ran direct from station without any means of equalizing pressure through the circuit; 8 No. 9 wires fed the dynamo of 221 lamps, and 6 No. 10 wires fed the circuit of 175 lamps. Candle-power in machine room—about 90 candles—at the end of circuit 1,000 feet away about, 8 candles. No cutouts, motors, indicators, feeders, feeder equalizers, ampere meters, ground detectors, or any apparatus whatever giving information about the operation of the plant.

The so-called automatic dynamo had rheostat in field circuit, which was varied from its full range during the course of the evening. Lamps almost entirely in balance, and never turned off. Lights up with starting of machines at 6 P. M., and stops with engine at 12 M., September, 1885.

#### CINCINNATI POST OFFICE.

The United States Electric Light Company contracted to install an electric light plant in this building and have it running by April 1st, 1885. An inspection made on September 25th, 1885, shows no lights running and but a small portion of the wiring finished, with gas burning everywhere in the building. This is an instance of the dispatch with which the guarantees of the above company are fulfilled.

#### NOT A SINGLE GAS JET.

In our last issue we published a clipping from the New York "Tribune" of September, 1884, giving a description of the absolute failure of Brush storage batteries to light the



Third Avenue Theatre, New York City. The following extract from the New York "Electrical Review" September 26th, 1885, shows to what extent the Edison system of lighting can be applied to the adornment of theatres, &c.:

This house possesses the most complete installation for incandescent lighting in theatres of any not only in this country, but in any other, from an artistic as well as scientific point of view. It would be impossible to do it full justice by pen. It must be seen to be appreciated at its worth. On entering the lobby the eye rests upon an effect in decoration which is, to say the least, unique and pleasing in the extreme. The walls, lined in a rich, dark color, are studded from dado to frieze with a profusion of flowers of velvet, silk and satin, cunningly made and artistically placed, their colors blending in perfect accord; and more—hid within the petals of the rose, the lily, and all this glorious array, shining forth their soft, mellow light, are hundreds of tiny glow lamps, lit by that most perfect handmaid of art—electricity.

These lamps are in series, in separate circuit, and range from 1 to 1 candle-power. As we pass on into the body of the house, one is struck by the fact that whilst the illumination is perfect, there is a certain rustic character in the light which we do not find in the light from gas under any conditions. The furnishings, which are here rich as well as tasteful, appear all the more effective under this soft, dreamy light. At the centre of the ceiling of the auditorium is set the grand chandelier, containing a large number of the Edison 16 candle-power lamps all aglow, and the effect is extremely fine. All through the body of the house, at the back of the parquette, in the balconies, everywhere we turn, the eye meets these incandescent lamps, in clusters of three, four and five, in brackets and in chandeliers. The footlights are Edison glow lamps, also those around the arch of the proscenium, and, most important of all, the border lights, far up among the combustible scenery, give assurance of safety from fire—in fine, not a gas jet is used in the house.

Right by the side of the stage-manager's desk stands the electrician, Mr. A. B. Murray, and from here he controls the lights of the whole house, raises or lowers them at will, cuts out part of a circuit or all of them, plunges the stage or house into darkness, and as suddenly illuminates it again, and all in an instant and with the utmost certainty.

The most effective arrangement of light is thus rendered possible, as was frequently evinced during the evening's play in a very novel manner. The lights are arranged in three circuits, one containing all the border lights, 110 in number; another the foot lights, in which there are 46, and those of the arch, containing 20 lamps; the third circuit comprises all the

lamps in the body of the house. There are in all 400 16 candle-power lamps.

Several 50 and 100 candle-power lamps are used for special purposes on the stage. The raising or lowering of the lamps is, of course, accomplished by throwing resistance coils into or out of circuit. In a separate portion of the building is located the engine room; the plant consists of a horizontal tubular boiler and a 20 horse-power New York Steam Safety Power Co.'s engine, driving a 600 Light Edison Machine of the Edison-Hopkinson pattern. The engineer is supplied with red and green glass pilot lights, and a set of resistance coils, with which he can regulate the supply to the mains. The installation has proved a complete success, and in speaking with Mr. T. M. Hogan, the decanter, he expressed himself highly pleased with the effect he had obtained by means of the electric light. The cost of this installation has been large, but it will so doubt give value received in the near future. Mr. Hill deserves much praise for the liberal manner in which he entered upon and carried it on to completion. It is a move in the right direction, and his lead will doubtless be followed by other metropolitan managers. It would be safe to predict that the day is not far off when all of our theatres will be lighted entirely by the incandescent light.

#### THE PROPORTIONS OF LIGHT AND HEAT EMITTED BY INCANDESCENT LAMPS.

An investigation has been made by Herr W. Poukett at the laboratory of the Technical High School of Hannover, for the purpose of determining how much of the electrical energy supplied to different types of incandescent lamps reappears as light and heat respectively. In these experiments the heat evolved from the lamps was ascertained by registering the rise in temperature of a weight of water in which they were immersed for a stated time. The photometrical measurements were made by the aid of Von Hoffman-Alteneck's normal flame. The illuminating power of the various lamps experimented upon was recorded while they were immersed in water as well as when hanging in

air, the loss of light in the former case being from one-twenty-fifth to one-eighth with different lamps. As the result of Herr Pankert's examination, it appears that in one of Siemens and Halske's 8-candle incandescent lamps, 74 per cent. of the total work of the current was lost as heat, while 26 per cent. was represented by the light emitted. With Edison's 16-candle lamp, 66 per cent. of the current was returned as heat, and 34 per cent. as light. In Swan's 30-candle lamp, 73 per cent. of the current was transformed into heat, and 28 per cent. into light.

#### ENGLISH CRITICISM OF THE EDISON SYSTEM.

The London "Pall Mall Gazette" contains the following with relation to the Central Station of the Edison Electric Illuminating Company of New York, 255 and 257 Pearl street, N. Y. City:

##### The Edison System of House-to-House Lighting.

"Is there much progress being made in house-to-house lighting by incandescence?" "Yes, there is in New York, the only real central station for incandescent lighting in the world, and that is the one due to the genius of Mr. Edison. In 1878 some scientific authorities told a Committee of the House of Commons that the introduction of the electric light was not possible, but four years later Mr. Edison had not only made it possible but evolved a system of distribution and measurement analogous to gas. The densest part of the business portion of New York was selected as the place for the first district central station, and early in 1882 the laying of the pipes per manas was commenced. The Edison system employs copper rods, which are insulated in iron tubes that have a thin lining of glass, and these tubes are buried in the ground. It may be asked, Why is it, that if Edison can put his conductors underground the arc light conductors cannot employ a low pressure electricity, technically a pressure of 100 volts, while on the long arc light circuits a pressure of 2,000 volts is sometimes employed. Now this greater pressure presents a greater difficulty in insulat-

ing or keeping in the current, which is always trying to burst out. Hence, by his use of low pressure electricity, Edison is enabled to employ underground conductors.

"Within this quarter of a square mile are buried about thirty miles of underground cables and conductors, with something like a hundred tons of copper in them, and a ramifying network of about a hundred miles of smaller wires in the houses join up into one vast network about five hundred and eighty customers who are supplied with electric light. For all these houses and offices some twelve thousand five hundred of the little glass globes, containing the carbon filament, are placed, and when any customer desires a light all he has to do is to turn a little tap which permits the electricity, always circulating in the main, to pass through his lamp and render the carbon thread incandescent.

"In the generating station in Pearl street there are eight great dynamos which always, night and day, one or more, as need be, are kept turning and pouring into the main the useful supply of electric current. Boilers of 1,000 horse-power in the lower story, consuming ten tons of coal a day, send up steam to eight Porter, Allen and Armstrong engines which drive the generating machinery. Special and ingenious devices show at a glance the demand for, and whether the pressure is up to standard. For two years this station has now continued to run and supply its clients with electric current. Not only is the current applied for lighting but for motive power. Anywhere on the system, that is, within the area of supply, a customer can have a small motor fixed, which is set spinning the moment the current is sent through it, and drives a fan or a sewing machine by means of energy supplied by steam engines perhaps a furlong off. Each customer draws his supply of electricity from the main through a meter which records the amount used. Bills are rendered monthly and accounts collected for the light supplied. It is reckoned to the consumers on the following basis, namely, light for light as the price of gas; 1,000 cubic feet of gas burnt in a five-foot burner yields a light equal to that given by 3,000 candles burning one hour. As an Edison lamp gives a light equal to 16 candles, it follows that at the rate of 11 cent per lamp-hour the charge for electric light is equivalent to gas at 23 dollars, or a little more than a halfpenny a lamp per hour. The inhabitants of this quarter of the town take very kindly to the incandescent light. They like it in their offices in the hot summer weather. For when the mercury in the thermometer climbs up, as it did this last September, to 95 deg. or 97 deg. in the shade, to work by gas in an ill-lighted office or warehouse is almost killing, but the little glass globes hang about everywhere containing each their shining thread of fine diffuse a light without heat, and illuminate without the heat consuming the precious oxygen in the air."

Mr. Charles Lever, an electrical expert, in an article in the English "Telegraphic Journal and Electrical Review" (September 26th, 1885) comments as follows:

The Edison central station in Pearl street has been described over and over again, so it will be unnecessary to go into any details here. The large Edison steam dynamo are also well known, so it will suffice to say that there are about eight of these 1,400 (fourteen hundred) lighters in operation, a few others being kept in reserve. Although this was the first experimental station for the supply of incandescent lights on a large scale, yet the company manages to pay a dividend of 4 per cent. on the capital invested. With the new type of Edison dynamo and the improved lamp, the same station could probably be put up to-day at one-fourth the original cost. Indeed, the Edison Company claims that it can erect a lighting station, supply the lights at the same price as gas, and earn a dividend of 20 per cent. on the capital invested. This company shortly expects to have another lighting station in operation in the up-town part of the city. It should be stated that the Edison Company charge their customers for the current consumed, which is registered by meter. These meters, which consist of two zinc plates immersed in a solution of zinc sulphate contained in a glass bottle, are collected at stated intervals and replaced by others. The zinc plates are accurately weighed, the current consumed calculated from the mean of the weights which one zinc plate has gained and the other lost, and the account sent in accordingly. In order that the zinc plates may last a long time, the current is reversed from time to time in its passage through the meter.

The Edison machine works in Greenwich street is well worth visiting. About twelve months ago my good friend Mr. Charles Batchelor returned from France to New York and accepted the management of this works. Since he has been there the Edison machine has undergone a number of improvements. In fact, there is no incandescent light dynamo in this country which can vie with these improved Edison machines in workmanship or efficiency. The relative quantities of copper wire and iron which should be used in the field magnets and armature has been so thoroughly improved upon the results now obtained. The field magnets throughout, including the yoke, are made of wrought iron of the best quality. They are much slimmer than even in Dr. Hopkinson's modification, and a great mass of iron is used in the field magnets with a surprisingly small quantity of copper wire. In a word, these new Edison dynamos are almost perfect.

By far the finest specimen of electric lighting on board a ship is to be found on the palace steamer *Pilgrin*, of the well-known Fall River line. This installation has been carried out by the Edison Company of New York, several hundred lamps being used. The electricians and fitters are simply exquisite in design and finish. How different from the disgraceful fittings on board some of our Atlantic steamers! During the evening performance on board the steamer's orchestra, an exceedingly pretty effect was produced by means of an Edison lamp of 100 candle-power, placed on the floor in the centre of the orchestra. All the light in the saloon being turned out, with the exception of a group of lamps at the end of the saloon opposite to the orchestra, a piece called "The Forge in the Forest" was performed. Along with the brilliant made as yet were made to click, whilst the light of the forge was excited, long well represented by the continued flashing of the 100 candle-power lamp, which, being hidden from the audience, exhibited a strange and weird effect in the partly darkened saloon. It is, perhaps, needless to say that the piece was enthusiastically cheered.

#### ELECTRIC LIGHTING IN LONDON.

Messrs. B. Verity & Sons, of Covent Garden, have obtained the contract for the whole of the electric lighting at the new Constitutional Club next to the Grand Hotel, Northumberland avenue. There are to be over 700 lamps in all, and the machinery being in complete duplicate, the total capacity of the entire plant will be 1,500 lamps. High speed engines and the newest type of Edison dynamo machines, made in New York, will be used. Special double-pole safety blocks in earthenware will be used for this installation. No expense will be spared to make this a model installation. The same firm is also installing nearly 600 16 C. P. incandescent lamps in the Criterion Restaurant. Owing to the extensive character of the building the wiring is of a difficult character. The grill room and buffet are already lighted up, the fixtures being glass pendants of quite a new design.

## AGAIN THE GAS GIVES OUT.

As further evidence of the liability to failure of gas plants, reference to which was made in our last issue, the following extracts will be found interesting:

SAVANNAH, Ga., September 28.—(Special).—To-night, owing to a break in the receiver, Savannah was left in total darkness, and the gas company was roundly abused.

LORENS, September 28th.—Shortly before eight o'clock the other night all the public and private gas burners in Lorens were suddenly extinguished. For a space of fully ten minutes the town was in complete and utter darkness, the result being that business people despairingly closed their establishments. Some sort of patching up was done at the gasworks, but with poor effect; even at nine o'clock the public lamps had an illuminating power equal only to that of a rush light. At the hotels and public houses the burners were turned off, and replaced by paraffin lamps or candles.

## PURITY OF ATMOSPHERE.

As is already generally known among our agents, the Lockport Gas Company, in order to prevent competition, adopted the Edison light, and are supplying both gas and electric light to their customers. The demand for the incandescent light has been so much greater than for gas, the price being the same, that the capacity of the electric light plant has been taxed to its utmost. The following item, from one of the Lockport local papers, is indicative of the feeling in regard to the two lights:

Maybe it is true that the local gas company, as its members assert, are making the finest gas produced anywhere, yet just the same it has a knack of smoking freely, a peculiarity—possibly a merit—while the gas farished at most places doesn't possess. For example, a few nights ago, though the outer temperature was much too high to be agreeable, while services were in progress, the doors and windows of the Baptist Church had to be opened to let out the smoke given off by the lights.

## STREET LIGHTING.

The following is an extract from the "Railway News" (Phila.) of September 24th, 1885:

Portland, Me., has taken steps towards solving the problem of effective street lighting in a way which promises to be perfectly satisfactory. Last week papers were issued at the office of the American Electric Manufacturing Company, by which the City of Portland, represented by Edward A. Noyes, Esq., Chairman of the Street Lighting Committee, contracts with the Consolidated Electric Light Company, of Portland, operating the American system, through its treasurer and general manager, Frank A. Sawyer, for the use of about two hundred and fifty Edison "manifold" lamps of such power (from ten to fifty candles), and so located as may be mutually agreed. It has been apparent to all recent visitors to Portland that a great change has taken place in the matter of street lighting during the past two years. The principal thoroughfare and large streets not previously provided for have been brought almost from a state of primordial darkness to one of brilliant and satisfactory illumination. To the system of one hundred are lamps, which has already accomplished so much, twenty-five are and two hundred and fifty incandescent are to be added, and will enable the city to discard every gas burner and naphtha lamp, and at a price mutually satisfactory to both parties. The former method, which did not by any means cover the whole territory, required four hundred and sixty-eight gas and one hundred and twenty-five naphtha posts. The Board of Aldermen authorizing this radical change can hardly be said to be "down on the gas company," as two-fifths of the stock of the corporation is owned by the city. Every effort has apparently been made by the gas officials to prove the electric system too expensive for permanent use. This combined system of arc and incandescent lamps, operated from the same steam plant, will also illustrate another important feature of the policy of the American Company in the organization of an incandescent department, and their compact with the Edison Company, these combining two standard methods of electric lighting.

The "manifold system," so-called, recently devised by Mr. Edison, has not heretofore been illustrated on a commercial scale, but is said to be one of the most flexible now offered to the public. No labor of attendance is required, with the exception of occasional replacement of exhausted lamps. The American Electric Manufacturing Company has the contract for the installation of this system, which is to be in running order by October.

The following editorial appeared in "The Saginawian," Saginaw, Mich., October 9th, 1885:

The Edison Electric Light Company was organized for the purpose of acquiring and owning all of Mr. Edison's patents for electric light, heat and power, in both North and South America; and from this, the parent company, all the sub-companies working under the Edison system derive their existence. Two hundred and sixty patents have already been issued to Mr. Edison in the United States, and there are applications for 187 additional patents still pending in the Patent Office. These inventions form the complete system of Edison's incandescent lighting, now so completely introduced into public use.

There are two methods of introducing the light, viz., by independent or isolated plants, where the apparatus is owned, controlled and operated

[illegible]

have decided to increase their capital stock from \$50,000 to \$100,000 and to change the name to Edison Light Company of Jackson. The School for the Blind at Lansing has adopted this plan, and it will be used in the new Insane Asylum at Travers City. It has no explosive characteristics, its entire safety in this respect being shown by the fact that it is already adopted in several extensive powder mills and magazines. It is the same, summer and winter, is the natural light for the eye, and as applicable to outside as to inside illumination. The one question, will it pay a fair interest on the investment, seems to be satisfactorily answered wherever it has been tried, but we shall defer that point for a further article. The name of the company organized in this city is "The Edison Electric Illuminating Company of Saginaw," and Ezra Rust, the instigator, who makes no mistake in business calculations, or ex-Averett Jerome, who is heartily in accord with Mr. Rust in advocating and supporting the project, can either of them make intelligent answer in regard to any and every point raised by those who desire to give this matter the careful and thorough investigation to which it is entitled.

#### CURRENT FROM EDISON DYNAMOS FOR TELEGRAPHY AND METALLURGY.

Among the many varied uses of an Edison dynamo, its application to telegraphy has found successful placement for two machines of 100 amperes 125 volts at the American District office, New York City, one at Philadelphia of 100 amperes 100 volts, and three at Chicago of 500 volts 100 amperes capacity for the Field stock tickers. Eugene Cowles, of Cleveland, Ohio, has in use two Edison dynamos of 110 volts and 800 amperes for smelting purposes in reducing the oxides of boron, silicon, aluminum, and other metals.

#### EDISON LIGHT IN NEWSPAPER OFFICES.

The following item was taken from the Toronto "Globe" of September 10th, 1885:

Judging by the contracts now being carried out by the Edison Com-

pany, this light appears to be not only maintaining but increasing its hold on public favor. In the "Globe" office the light has been in use since November last, and its economy, perfect reliability and other advantages has since then been so well proved as to justify the "Globe" Company in depending wholly upon this method of illumination in the future. To this end a new Edison machine to run the lights used in dark corners during the day has lately been purchased, and there may now be seen in Toronto one establishment at least in which gas as an illumination is a thing of the past. The same light is used in the Great Northwestern Telegraph Office, in this city, and gives great satisfaction. Among the installations of Edison plant recently made, or now being made, by the Canadian Department of the Edison Company are the following: The Gazette Printing Company's premises in Montreal; the Post Office, Montreal, 100 lights; the Great Northwestern Telegraph Company's building, Montreal, 100 lights now running; the Parliament Building, Ottawa, 400 lights, and the Magog Textile and Print Co., Magog, 250 lights, all of which orders have been closed within the past two months, which speaks well for both the light and the Canadian management of the Edison Co.

#### TESTIMONIAL.

DEPT. MILITARY SCHOOLS & TACTICS.

IOWA AGRICULTURAL COLLEGE.

AMES, IOWA, May 28, 1885.

GEO. H. BLISS, Esq., Gen'l Supt. Western Edison Light Co., Chicago, Ill.:

DEAR SIR—Your favor of the 25th is hand, and noted. To give you a correct knowledge of our experience with your electric light and our old system of gas made from gasoline, will state our average monthly expenses under the two systems:

With gas, it cost us monthly for labor \$46.70; for coal, \$37; for kerosine, \$75, making a total of \$158.70 per month.

With the electric light it costs us monthly for labor \$84; for coal, \$45.00; for lubricating oil, \$1.50, making a total of \$131.

The incidental repairs have been about the same, of very small account in either case.

I have charged against the electric light the salary of my engineer, \$75 per month, but he does all our work in addition, repairing our steam heating apparatus and waterworks, and came from \$30 to \$40 per month in those departments, so it really reduces the monthly expense to near

\$100 per month. However, if there should be no expenses for repairs in those departments, the light would have to pay his salary; but the history of the past gives us so many hopes for relief in those departments, so it is safe to expect relief financially from them; but a cheaper man could run the lights successfully if he had no outside work.

As to the quality of the light it is perfect, the only undesirableness we have coming from the character of the building in which the apparatus is placed—it is in nowise the fault of the plant. It seems to me those using the electric light should first have a perfectly solid foundation upon which to place their plant, and second, an engine suited for the work, and perfect satisfaction will be the certain result.

Respectfully Yours,  
(Signed) JAS. HEST LINCOLN,  
Steward of the Iowa Agricultural College.

#### THE LARGEST ELECTRIC LIGHT PLANT IN THE WORLD—ST. LOUIS MUSIC AND EX- POSITION HALLS.

The Entire Structure Lighted With Over 5,000  
Edison Lights.

This building is undoubtedly the largest and most finely equipped permanent building for exhibition and general amusement purposes in this country. The structure is of brick, stone and iron, of fine architectural proportions, and in harmony in every detail with the purpose for which it was designed. It contains the largest music hall in this country, being 120x300x80 feet in height, and is provided with the most commodious stage in the United States. The auditorium has an unusually large seating capacity, the lighting of which has proved successful beyond anything heretofore done in illuminations of this description. There is also an amusement hall, elaborately furnished, beautifully proportioned, and having seating capacity of over 3,000. There are in addition four large art galleries which must be seen to be appreciated to their full extent. Adjoining these are

large sculptural halls, bric-a-brac parlors and other rooms for display of art and curios. The Machinery Hall, including hydraulic section, textile and wool-working machinery, occupies the entire basement, forming in its completeness an ideal machinery exhibiting space. The nave of the Exhibition Building are designed especially for display of manufactured and general exhibits. These naves form an "L" of the Grand Exposition Nave, which is 80 feet in height, of Gothic style. In their total length they have over one thousand feet, the Grand Exposition Nave having the greatest width. The view from these galleries is magnificent, taking in as it does these mammoth areas.

During Exposition hours every light is in use. The amount of floor space covered is over 400,000 square feet. The Edison Company has had larger temporary lighting, such as Louisville, New Orleans, and others, with over 5,000 lights, but this is the largest permanent plant in any one building in the world.

The Lights are distributed as follows:

	Lights.
Mechanical Department.....	240
Machinery Hall.....	300
Agricultural Department.....	108
Main Floor, Grand Exposition Nave.....	232
Gallery Floor, Grand Exposition Nave.....	262
Main Entrance.....	28
Main Entrance Hall.....	81
Parlors, Offices, etc.....	71
Two East Art Galleries.....	192
Two West Art Galleries.....	192
Two Art Audiums.....	28
Sculpture Hall.....	48
Four Fine Art Rooms.....	36
Four Bric-a-brac Rooms.....	24

#### LARGE MUSIC HALL.

Foot Lights.....	80
First Floor Corridor.....	21
Second Floor Corridor.....	27
Face of First Gallery.....	65*

	LAMPS.
Under First Gallery.....	16
Side Lights under First Gallery.....	20
Side Lights over First Gallery.....	20
From Dome.....	240
Over Dome.....	20
Dressing Room.....	24
Parlors.....	10
Stage.....	90

## AMUSEMENT HALL.

Entrances and Halls.....	88
Offices.....	16
Parlor.....	8
Refitting Rooms.....	10
Stage Back Light.....	20
Border Lights.....	80
Foot Lights.....	30
Dressing Rooms.....	10
Auditorium, under Gallery (Wall).....	10
Over Gallery (Wall).....	17
Face of Gallery.....	42
Under Gallery.....	10
Over Gallery.....	8
Dome.....	40
Special Lighting in the Building.....	400

5,566

EDWARD H. JOHNSON,

President.

No 10.

## BULLETIN FOR AGENTS.

THE EDISON COMPANY FOR ISOLATED LIGHTING,  
65 FIFTH AVENUE.

NEW YORK, NOVEMBER 4, 1885.

## CONTRACTS CLOSED.

We have closed contracts since August 19th, for the installation of 47 plants, aggregating 8,164 lamps. The Western Edison Light Company are installing 6 plants of 991 lamps capacity, making a total of 8,855 lamps. The following is a list of contracts closed.

SOLD BY	PURCHASER.	No. Lamps Installed	Amount Contract
Benton & Hughes.....	Central Milling Co., Niagara Falls, N. Y.	114	100
Benton & Hughes.....	George West, Hamilton Spa, N. Y.	100	100
Benton & Hughes.....	Capt. William Turbridge, Apartment Houses, 31-32 Clark Street, Brooklyn, N. Y.	520	250
Benton & Hughes.....	Black & Banger, Power's Hotel, Hudson City, N. Y.	25	25
Benton & Hughes.....	Union Printing & Publishing Co., Lock- port, N. Y.	200	200
Benton & Hughes.....	Ward & Cobb, Lockport Journal, Lockport, N. Y.	25	25
Benton & Hughes.....	R. H. Wolff & Co., 180 Pearl Street, New York City	200	200
	Carried forward.....	1,130	975



Under First Gallery.....	Lamps,
Side Lights under First Gallery.....	16
Side Lights over First Gallery.....	20
Prom Dome.....	20
Over Dome.....	20
Dressing Rooms.....	24
Parlors.....	16
Stage.....	90

## AMUSEMENT HALL.

Entrances and Halls.....	88
Offices.....	16
Parlor.....	8
Waiting Rooms.....	16
Stage Dressing Rooms.....	20
Border Lights.....	80
Foot Lights.....	30
Dressing Rooms.....	16
Auditorium, under Gallery (Wall).....	16
Over Gallery (Wall).....	17
Under Gallery.....	22
Over Gallery.....	10
Dome.....	8
Special Lighting in the Building.....	400

3,086

EDWARD H. JOHNSON,  
President.

No 10.

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SOLD BY	PURCHASER.	Number Lamps	Capacity
Benton & Hughes.....	Central Milling Co., Niagara Falls, N.Y.	114	100
Benton & Hughes.....	George West, Ballston Spa, N. Y.	100	100
Benton & Hughes.....	Capt. William Turnbull, Jr., National House, 61-55 Clark Street, Brooklyn, N. Y.	200	200
Benton & Hughes.....	L. Stuchardt & Son, N. Y. City.	25	25
Benton & Hughes.....	Black & Sargent, Power's Hotel, Rochester, N. Y. (Increase).	50	500
Benton & Hughes.....	Union Printing & Publishing Co., Locke.	35	35
Benton & Hughes.....	Ward & Cobb, Lockport "Journal," Lockport, N. Y.	35	35
Benton & Hughes.....	H. H. Wolf & Co., 180 Pearl Street, New York City.	200	200
	Carried forward.....	1,100	676

SOLD BY	PURCHASER	No. Lamps Ordered	Approximate Capacity
Benton & Hughes	Brought forth	1,130	975
Benton & Hughes	The Mierets Shod Cloth Co., Mierets, N. Y.	75	60
Benton & Hughes	Merrings & Smaller Panama Co., New York City	250	250
Benton & Hughes	Deland & Co., Fairport, N. Y. (Ch- cress)	100	100
Benton & Hughes	Amos Bros., Springfield, N. Y.	75	60
Benton & Hughes	"The World," New York City. (In- crease)	100	400
Benton & Hughes	Pumpkin Horse Shoe Co., Poughkeepsie, N. Y.	25	25
Benton & Hughes	Chas. Tuller's Mill, Pulaski, Georgia Co., N. Y.	60	60
Hyblsey & Schroeder	Standard Bookery, Hutterford, N. J.	100	60
Hyblsey & Schroeder	C. Chadslon, Burlington, N.	250	250
Hyblsey & Schroeder	Trenton Iron Works, Trenton, N. J.	100	100
Hyblsey & Schroeder	George Hays, Elizabeth, N. J.	100	125
Hyblsey & Schroeder	S. E. Wilson, Weldon Mills, Trenton, N. J.	75	75
Hyblsey & Schroeder	Sawmest Distilling Co., East Millstone, N. J.	60	60
Card, B. P.	Gilman Bros., Homestead, N. J.	60	60
Card, B. P.	A. W. Hays, Brooklyn, N. Y.	250	250
Clark & Duvall	G. Hauserachmidt, Baltimore, Md.	165	160
Crouse, T. F.	A. H. Bell & Co., Dallas, Texas	100	100
Crouse, T. F.	Empire Mills, Dallas, Texas	35	35
Crouse, T. F.	"The Herald," Dallas, Texas	50	50
Hitz, W. F.	Kansas State Asylum, Topeka, Kansas	800	500
Hitz, W. F.	Kansas City "Times," Kansas City Mo.	200	200
Hitz, W. F.	Kansas City Bridge & Iron Co., Kansas City, Mo.	50	50
Humbled, J. S.	John Du Bois, Du Bois, Clearfield Co., Pa.	300	300
Humbled, J. S.	Sotter & Bros., Potlows, Penn.	25	25
Lawson, A. J.	Essex Printing Co., Montreal, Canada	150	150
Lawson, A. J.	Parliament Buildings, Ottawa, Canada, (Increase)	450	300
Lawson, A. J.	Gilman Cotton Mills, Frederick, N. H.	800	380
Lawson, A. J.	Bank of Montreal, Montreal, Can.	25	25
Markle, J. H.	E. D. Palmer, Richmond, Ind.	60	60
Markle, J. H.	Notre Dame University, South Bend, Ind.	100	100
Markle, J. H.	Honest Oak Store Works, Davenport, Iowa	100	100
Markle, J. H.	Milwaukee	100	100
Markle, J. H.	James Hays, Muskegon, Ind.	400	350
Markle, J. H.	"Bates House," Indianapolis, Ind.	100	100
New York Office	James N. Williamson, Gloucester, N. Y.	100	100
New York Office	Hoffman House, New York City	300	300
Palme & Frensch	James Maffei, Co., Lewiston, Me.	200	200
Palme & Frensch	Boston "Herald," Boston, Mass. (In- crease)	100	300
Palme & Frensch	Shiner & McDevitt, Escambia, Fla.	60	60
Totals		6,164	7,005

# PLANTS INSTALLED BY THE WESTERN EDISON LIGHT COMPANY.

FROM SEPTEMBER 1ST, 1885.

	No. Lamps Wired for	Dynamic Capacity.
Badger Paper Co., Kaukauna, Wis.	107	100
Two Rivers Mfg. Co., Two Rivers, Wis.	245	250
National Soldiers' Home, Milwaukee, Wis.	100	200
Cross Bros. Mfg. Co., Chicago, Ill.	200	500
S. L. Wiley, Oshkosh, Iowa	60	60
Van Sorenst Paper Co., Bellevue, Ill.	140	150
991		910

## AWARDS FOR THE EDISON SYSTEM OF ELECTRIC LIGHTING.

We have been asked by some of our agents to furnish information as to the premiums awarded to Mr. Edison in various parts of the world where other alleged methods of incandescent electric lighting have been foisted on the public. It will be seen by the following showing that the lending scientists of Europe and the United States have accorded to Mr. Edison the invention of the only practical system of incandescent electric lighting now extant:

### MR. EDISON'S AWARDS AT PARIS.

The "International Congress of Electricians" at Paris, 1882, subdivided its work among juries, to each of whom certain special subjects were assigned. The highest possible award the Congress could give was a Diploma of Honor, that being higher than a Gold Medal. The final award to Mr. Edison, made by the second jury, was three Diplomas of honor, two gold medals and a silver medal. Pursuant to usage, however, the Congress reserved the right to recognize awards, so as to give to each exhibitor the highest award

which he had received in any one class, and the Congress therefore approved the recommendations of the jurists, and itself awarded a diploma of honor to Mr. Edison. Altogether there were only eleven of the highest possible awards (the diploma of honor) granted by the full Congress, and of these only two were given to Americans, namely, one to Mr. Edison, and the other on account of the telephone. The only diploma of honor awarded for an incandescent electric light was awarded to Mr. Edison. In addition to the foregoing awards, Mr. Edison received from the French Government the decoration of Officer of the Legion of Honor. He had been previously made Chevalier of the Legion of Honor, but the higher rank of Officer was conferred on account of his exhibit at the Paris Exposition.

Another writer says:

"Mr. Edison is the only inventor in electric lighting, who has a complete System. In the case of other inventors, one claims to have a lamp, another a dynamo, another a regulator, and still another all three of these things." But Mr. Edison has gone further, and has perfected not only a dynamo, a regulator and a lamp, but also motors, motors, conductors, underground mains, junction boxes, sockets, chandeliers, brackets, and a large number of other devices, altogether constituting a complete and perfect system of electric lighting. This comprehensiveness and perfection of detail is peculiar to Mr. Edison, and it is this which secured such matchless praise for him from scientists at Paris during the last summer, when high European authorities, like Fresco and De Moivre, who has previously entertained doubts regarding his success, expressed themselves as being converts to "the perfection and completion of the Edison System."

Professor W. H. Preece, F.R.S., London, in a special report on the progress of the electric light in England in 1882, says:

"Most of the experiments that have been tried and the installations that have hitherto been made, have been in connection with Arc Lamps, but the results of the experiments and the lessons learned in Paris show unmistakably that the Arc Lamp is only suitable for streets and large spaces; and that for internal purposes, for office work and household pur-

poses, there can be no question whatever that the system by incandescence is that which will eventually supplant gas.

"There are four systems of incandescent light now on trial. The Swan; the Lane-Pox; the Mason; and the Edison. I have examined them all with very great care, and I have come to the conclusion that by far the best in all its details is that of Mr. Edison—in fact his system leaves little to be desired.

"I have no doubt of its success, and my opinion of the perfection and completion of the Edison System is fully given in the paper read before the Society of Arts."

The following is from the London "Nature," 1882:

"... Mr. Edison saw the merits of the incandescent system for domestic lighting at a time when other electricians were giving all their attention to the arc light; and therein showed his genius and foresight. For it is evident now to electricians that while the arc light is well enough adapted for the lighting of large areas it is unsuitable for small interiors."

Mr. Lalouchere, in an article in "Truth," May 25th, 1882, after commenting in very severe terms upon the questionable methods adopted by certain light companies to float their stock upon the London market, makes an exception with reference to the antecedents of Mr. Edison, of whom he speaks as follows:

"The most practical of electricians is, I think, Mr. Edison. ... Electrical lighting will, I have no doubt, eventually replace gas; and if I had to pin my faith upon a man in respect to a system, it would be upon Mr. Edison. ... Why I have alluded favorably to Mr. Edison is because he seems to be the most practical man connected with electric lighting; I neither believe nor disbelieve in his lamps and dynamo machines, but I think that, because he is a practical man, and because he has much skilled knowledge in connection with electricity, he is more likely than his competitors to succeed in giving us a perfect system of electric lighting based upon the essential requirement that the light will be as cheap or cheaper than gas."

The report of the Sub-commission on Incandescent Lamps, International Exhibition of Electricity, Paris, 1881, is a lengthy document containing an exhaustive description of

the four incandescent lamps exhibited, and a critical analysis with experimental results of the efficiency of each lamp. The lamps reported on are those of Edison, Swan, Maxim (United States E. L. Co.) and Lane-Fox; and the superiority of the Edison lamp in every respect is established, and especially in respect to (1) high resistance, (2) loss of current per minute, (3) comparative energy required, (4) number of lamps per horse-power, and (5) general efficiency.

The full text of the report was published in the London "Electrician," June 17th, 1882.

The following is an extract from "Journal des Debats," Paris, France, September 8, 1881:

#### THE INTERNATIONAL ELECTRIC EXHIBITION.

We shall soon begin to study thoroughly the discoveries in the field of electricity as exhibited in the Palais de l'Industrie, but will not delay in speaking of the marvellous applications of electricity to the illumination of our dwellings of facts realized with the incandescent lamps whose action, so complete, is due to the illustrious scientist of Menlo Park.

His name is inscribed on a plaque over the door of salon 24, "Edison." On visiting his exhibition and observing the various and numerous products of his genius, the words of Bacon are recalled to our mind "to give a new invention to the world seems truly to be the finest act a man may perform. Every new invention may become a boon to mankind, whilst the works of politicians only benefit individuals of some countries. The duration of the latter is of but a few centuries, that of the former is eternal. Inventions benefit all without causing pain or damage to any."

If there is an invention which merits these words, it is certainly that of the American scientist, for it alone presents in all its parts that admirable characteristic of completeness, and enables us immediately to realize a great progress to the advantage of all.

Other incandescent lamps ingeniously constructed are exposed in the salon adjoining Edison's, but none of them give that soft and pure light and steady clearness, nor are they attached to any really practical system of installation.

Let it be said in the interest of truth, progress and general welfare, that Edison's system constituted a complete revolution in domestic illumination, and he will very shortly be called upon to supplant all other systems in use.

\* This opinion may at first seem exaggerated to those who have not examined Edison's illuminating apparatus.

We are apt naturally to distrust new things, an excellent precaution, which we in France carry perhaps to excess, but when the evidence of facts are so convincing, it is but just to recognize it. It is even a pleasure to a sensible man to do so, especially when the way has already been pointed out to him by those whose science and competence in matters submitted to their judgment have never been questioned.

Such is the case with Mr. Edison; as interesting a case as ever existed. Our readers will recollect the furor raised among scientific men of France by the news of the discovery of his system of illumination. It first caused enthusiasm, soon modified by the criticism of competent scientists, and particularly, M. du Moncel, the eminent electrician manifesting an opposition to Edison's system in an article that caused a great sensation among the most enlightened electricians, and denied its practicability. To be sure, an ocean lay between the laboratory of the hermit of Menlo Park and the study of M. du Moncel; but since Edison's system has crossed the sea, M. du Moncel has changed his opinion, for in a letter which has been shown us, he welcomes the new arrival, after enumerating the experiments with other incandescent lamps, in these words:

"All these experiments achieved but moderate success, to say no more, and when in 1879 the new Edison incandescent carbon lamp was announced, many of the scientists, and I particularly, doubted the accuracy of the reports which came from America. This loose-shoot of carbonized paper seemed incapable to resist mechanical shocks, and to maintain incandescence for any considerable length of time. Nevertheless, Mr. Edison was not discouraged, and despite the active opposition made to his lamps; despite the probable absurdity of which he was the object, he did not cease to perfect it in a practical way, and he succeeded in producing the lamps which we now behold exhibited at the exposition, and are admired by all for their perfect steadiness.

Here are declarations which certainly cannot be suspected, and which do honor at the same time to their author and to him who is the subject of them. \* \* \*

"After a while we shall recall the inconvenience of these as we recall the joys of our diligences formerly, the badly made candle melted and, dripping upon dresses and heels, the crystal rings broken and falling on the shoulders of the dancers, the cry of fire, to which the burning of the bed curtains gave rise, and the enormous odor of the wax candles and a smoking wick. Now of these with the Edison light. It burns safely and pure enclosed in its globe, and releases so little heat that the most delicate hand can hold it without fear of being burnt.

"When we say that the Edison system is on the road to produce a complete revolution in our habits, we only draw a conclusion from a series of observations, and this conclusion is more strongly confirmed when we compare the light of gas to that of the incandescent light of the American scientist.

"Mr. Siemens, in a lecture lately delivered before some engineers upon the gas in use at London, expressed the opinion that in consequence of the application of electric lighting that gas, yielding 10 per cent. of heat and only 10 per cent. of illuminating power, is destined to become the natural agent at least. We absolutely share this opinion. One will follow the destiny of all terrestrial things which encounter another better organization. It will be vanquished. It is the destiny of the weak; it is the eternal law of the combat for existence—a law the development of which is equally fatal in the recommended phenomenon as in the phenomenon of life.

"On one side the system of Edison with his lamp, on the other gas and its analogous products will develop themselves in the sphere better adapted to their nature. Rich in heat, gas may be carefully employed in the production of steam for heated power.

"If the record is reliable, it says that gas light was discovered by Lebon in 1790, and was applied for the first time in 1817 at Paris in the Passage des Panoramas by an English company.

"The discovery of Edison in 1879 will, we have good reason to believe, require less time to become popular."

At the International Electric Exhibition (1883), held at Crystal Palace, London, England, Mr. Edison was awarded the only gold medal given for a complete system of electric lighting.

#### FIRST PRIZES FOR THE EDISON EXHIBIT AT CINCINNATI.

The jury appointed by the Commissioners of the Cincinnati Exposition (1883) to report upon the subject of Electric Lights, consisted of Prof. T. C. Mendenhall, (Chairman), Professor of Physics of the Ohio State University, Columbus, Ohio; Prof. H. T. Eddy, Professor of Mathematics and Engineering, Cincinnati University; Prof. Thomas French, Professor of Physics, Cincinnati University; and Mr. Robert Laidlaw,

a mechanical expert connected with the establishment of Messrs. Lane, Boiley & Co., Cincinnati. The prize of five hundred dollars, for the best System of Incandescent Electric Lighting; also a gold medal, for the best Incandescent Electric Light; also the first prize for an Incandescent Lamp Dynamo, were awarded to the Edison Company, *being all the prizes they competed for.*

#### FIRST PRIZES FOR THE EDISON LIGHT AT THE LOUISVILLE EXPOSITION.

Four first prizes were awarded the Edison Company by the jury appointed by the Commissioners of the Southern Exposition held at Louisville in 1883. These prizes were for (1) the best Incandescent Light System; (2) the best Dynamo for Incandescent Lights; (3) the best Electric Lamp for Incandescent Light; and (4) the best Incandescent Light. The jury consisted of Mr. Benjamin Rankin, Chairman, Superintendent of the Louisville Gas Company; H. W. Eaton, Ph. D., Professor of Physics and Chemistry at the Louisville Male High School; Mr. W. W. Weaver, Mechanical Engineer, connected with the Babcock & Wilcox Boiler Co., Chicago, Ill.; Mr. Charles Smith, Electrician and Superintendent of the Western Union Telegraph Co., at Louisville; and J. A. Thayer, M. D., Lecturer and Scientist, of Polytechnic Society of Kentucky, Louisville.

The following extract is from the Report of the Jury, dated November 9th, 1883:

"The tests of the Edison system are most satisfactory as to the efficiency of the various appliances, the steadiness of the light produced and the general results. It is a matter worthy of notice that during the 100 days of the Exposition with over 4,000 Edison lights burning, there was not at any time a suspension of light from failure of the appliances of the Edison Electric Lighting Company."

The average life of 4800 lamps during the whole period of the Exposition was 1,800 hours.

The following are some reports bearing on the Edison system:

(1) Report upon the comparative efficiency of the Edison dynamo, by Professors C. P. Brushett and C. A. Young, of the College of New Jersey, Princeton, published in the "Scientific American," May 10th, 1882.

(2) Report of Mr. John W. Howell, of the Stevens Institute of Technology, Hoboken, on his tests of the Edison dynamo, lamps and conductors, published in "Van Nostrand's Engineering Magazine," January, 1883.

(3) Report of the Sub-commission on Incandescent Lamps, made to the President of the Experiment Commission of the Jury of the International Exhibition of Electricity, Paris, printed in the London "Electrician," June 17th, 1882.

(4) A paper presented to the French Academy, Paris, dated November 20th, 1882, by five members of the Experiment Commission of the Jury of the International Exhibition of Electricity, giving the results of their tests on incandescent lamps, said tests being supplemental to the Commission's work on machines and arc lamps. This paper is printed in the "Comptes Rendus" of the above date.

#### FRANKLIN INSTITUTE (PHILA.) ELECTRICAL EXHIBITION.

The following is from a report of a Special Committee to determine the efficiency and duration of Incandescent Electric Lamps at the Franklin Institute, Philadelphia, Pa., 1885:

TO THE BOARD OF MANAGERS OF THE FRANKLIN INSTITUTE:

GENTLEMEN—Herewith transmit the report of the Committee, consisting of J. B. Murdock, Esq., U. S. Navy; Louis Duncan, Ph. D., Esq., U. S. Navy; William D. Marks, Whitney Professor of Dynamic Engineering, University of Pennsylvania; George M. Ward, M. D., Photometric Report of the Trustees of the Philadelphia Gas Works, appointed under authority of the resolution of the Board, adopted November 12, 1884, to conduct examinations and tests of the efficiency and life duration of incandescent lamps.

I believe that the examination has been more thorough and that the report is more complete than anything that has hitherto appeared on the

subject; and the Institute is deeply indebted to the members of the Committee for their faithful, zealous and intelligent discharge of their professional duties.

Very respectfully,  
W. P. TATHAM,  
President.

PHILADELPHIA, July 8, 1885.

[HONORATION OF THE BOARD OF MANAGERS, Nov. 12, 1884.]

WHEREAS, Through delay and lack of time on the part of many of the Examiners, several of the largest exhibits at the Electrical Exhibition have had either incomplete examination or have had none at all; therefore, be it

Resolved, That the President be directed to take such steps, appoint such committees, and incur such expense, not exceeding three thousand dollars, as shall be necessary to complete in a satisfactory manner the examination of exhibits.

MR. W. P. TATHAM, President of the Franklin Institute:

Sir—I have the honor to herewith transmit the report of the Committee on the Duration Test of Incandescent Lamps, conducted under the auspices of the Franklin Institute.

I am, very respectfully yours,  
J. B. MURDOCK.

PHILADELPHIA, July 8, 1885.

#### DURATION TEST OF INCANDESCENT LAMPS.

[From Supplement Franklin Institute Journal.]

The scheme for a duration or life test of incandescent lamps was organized during the Electrical Exhibition by the Executive Committee. It had been recognized that tests of incandescent lamps for the determination of the efficiency alone afforded no data for deciding upon their

relative value, the lifetime of the lamp being an important factor in the question of economy. A test which should furnish information on this point would be very valuable. Plans were early made for such a test, but as the time required was such that it could not be conducted by the Photometric Group of the Board of Examiners, it was placed in charge of a special committee, and invitations were extended to the principal incandescent light companies to enter their lamps. Before the necessary arrangements could be completed several of the members of the special committee were compelled by their engagements to leave Philadelphia.

The Board of Managers of the Franklin Institute thereupon placed the conduct of the tests in the hands of its president, who filled the vacancies existing in the committee, and authorized preparations for conducting the test on a larger scale than was possible during the continuance of the Electrical Exhibition. Three rooms in the exhibition building were set apart for the test.

A code had been prepared, specifying how the test should be conducted. This code was signed in December by Mr. Weston and Mr. Upton, representing the interests of the United States and the Edison companies. The Brush-Swan and the Berendin companies declined to enter their lamps. The Franklin Institute entered a lot of Washburne & Rawson lamps, obtained from the Van de Poole Company, and also two grades of the Stanley-Thompson lamp, made by the Union Switch and Signal Company of Pittsburgh. The president of the Franklin Institute subsequently entered, for efficiency measurements, and for such a test of duration as circumstances would permit, a lot of Weston lamps (paper carbon), furnished by Mr. Weston; a lot of Washburne & Rawson lamps, received from the Edison Lamp Company, and a lot of White lamps, from the Electrical Supply Company.

In order to secure satisfactory results, and prevent needless discussion, the following code was agreed upon for the conduct of the test:

PROPOSED CODE FOR DURATION TEST OF INCANDESCENT LAMPS TO BE MADE BY THE FRANKLIN INSTITUTE OF THE STATE OF PENNSYLVANIA.

The parties hereto subscribing do agree to accept the services of the Examiners herein named, and to abide by the method adopted for the test, and by the results obtained without appeal.

NAMES OF EXAMINERS.

Lieut. J. B. MURDOCK, U. S. N.	Edw. L. DESAN, U. S. N.
Prof. Wm. D. MARKS.	Dr. G. M. WARR.

Each company to enter twenty lamps. The Examiners will select fifty lamps from a supply furnished by the companies, of not less than one hundred lamps. Twenty of these will be used in the preliminary adjustment of the circuit, and then replaced at the beginning of the test by twenty similar ones, until then unused, save for preliminary determinations.

A preliminary test of each lamp under normal conditions will be made before the beginning of the continuous test, and the time used will be credited to each lamp.

This preliminary test will determine the spherical intensity of the illumination and the reduction factor.

The Franklin Institute shall have the right to enter lamps of different kinds for the test, such lamps to be treated in all respects as though entered by a competing company.

The difference of potential between the mains will be kept at 120 commercial volts. Weston's lampholder automatic regulator will be used, and no other adjustment of the potential of the mains will be attempted, save in the case of wide variation. A volt meter will be kept in circuit all the time.

A resistance of German-silver wire will be placed in circuit with each lamp, and a preliminary adjustment made, to give the lamp its proper difference of potential.

Exhibitors will give the potential required by their lamps. Unless the lamps are separately marked, all lamps of the exhibitor will be considered as exactly similar.

An Edison "T" dynamo, driven by a Porter-Allen engine, will be used. The circuit will be opened occasionally and the lamps allowed to cool.

Lamps shall be considered as out of the test when they fail to burn, whether due to breaking of glass or filament. When a lamp gives out, it will be replaced by one requiring substantially the same difference of potential. The first three lamps of each company which are broken shall be replaced by others for which the preliminary measurements have been made, to be used only in case of accidental breakage.

The test may be declared ended at any time when, in the opinion of the committee, one system is so far in advance that a longer test could not change the result.

#### MEASUREMENTS.

Measurements of currents, difference of potential between terminals of lamp, and photometric intensity, will be made. The lamps will be arranged in a circle, having the photometer bar for a radius, and will be placed with the plane of the lamp perpendicular to the bar. All measurements will be reduced to mean spherical intensity, by multiplying the intensity measured, by a reduction factor determined for each lamp. Photometric measurements will be made as necessary, but not oftener than once daily.

Electric measurements will be made daily.

A record will be kept of each lamp, in which all data relating to it will be entered.

Weekly reports will be made to the Franklin Institute of the observations made, and showing how long each lamp has been under test.

#### METHOD.

The legal ohm will be considered the standard of resistance. The ampere will be determined by the silver voltmeter, and checked by calculation of the constant of the current galvanometer used. The volt will be taken as that E. M. F. which produces a current of one ampere in a resistance of one legal ohm. The ampere equivalent of silver as determined by Lord Rayleigh will be accepted as correct.

Currents will be measured by a tangent galvanometer, the constant of which will be determined by the silver voltmeter, and checked by calculation.

A standard resistance of German-silver wire wound on a reel will be carefully measured in turpentine or neutral oil, the temperature being observed. The potential galvanometer may be calibrated by connecting to the terminals of this resistance while a current simultaneously measured is passing through it. The temperature of the liquid will be observed and the resistance corrected therefor.

Collisions will be made frequently during the test.

Potential may be measured by a mirror galvanometer in solution circuit of high resistance.

Each company will be permitted to have one authorized representative in attendance throughout the test, and every facility will be given to those representatives to inspect the working of the test that will not interfere with its progress.

The Franklin Institute agrees to keep the lamps under proper surveillance, and to take necessary precautions for their safety. Lamps accidentally broken will not be charged against the companies.

The right is reserved to discontinue the test at such times and for such periods as may seem advisable or necessary.

A preliminary test will be made before the actual test begins, to insure good working.

In case any objection be made, or difference of opinion should arise between the committee and the contestants, the unanimous vote of the committee shall be final.

If, however, there be not a unanimous vote, the minority of the committee shall appoint one referee and the majority another; these two shall appoint a third referee.

The decision of a majority of these referees shall be final.

(Signed)

FRANCIS R. UPTON,

United States Electric Lighting Company,  
per EDWARD WARREN, Electrician.

The test began with the following lamps entered:

20 Weston .....	1103 volts.	Tamplin-Carlson.
20 Edison .....	84-100 "	"
10 Woodhouse & Hawson ..	55 "	"
10 Stanley-Thompson .....	56 "	"
10 " .....	44 "	"

The latter lamps were requested to be entered at sixteen candle-power. The committee, after a preliminary trial of several of the lamps, fixed on the potentials of 96 and 44 volts, respectively, for the two grades, as approximately representing that candle power, and the lamps were entered at those potentials.

No official information was furnished the committee as to the process of manufacture of any of the lamps.



The Weston lamp entered by the United States Electric Lighting Co. has what has been called a "linadine" carbon. The committee was not furnished with any official information as to the manufacture of the lamp, but the main features were shown by Mr. Weston in his private exhibit at the exhibition, afterwards presented by him to the Franklin Institute. Gun-cotton in the form of flat sheets was treated chemically to separate the nitryl from the cellulose. The resulting cellulose product is a tough, firm, translucent substance from which the strips are cut in a sinuous form and carbonized. The carbon is rectangular in cross section, but is placed in the lamp so that at its shanks the longer side of the rectangle is in the line of the shanks, instead of at right angles as in most other lamps. The connections are made at the terminals with minute steel screw bolts and nuts setting up with platinum washers. The bending of the carbon turns the long side of the rectangle so that it lies in different directions at different points.

The lamp is mounted on a wooden base surrounded by a brass ring. The wires are led down through holes in the wood to the bottom of the base, where one is soldered to a ring and the other is held in place by a small screw, which is concentric with the ring and projecting below its plane. The socket contains two spring clamps against which the terminal ring and screw of the lamp press, the lamp being held in place by a lug on the brass ring fitting into a groove in the socket. The lamps and sockets in the test were readily interchangeable and the connections were good throughout.

The Edison lamps were similar in appearance to those generally used. The carbon was made from bamboo fibre. The lamps were mounted in the ordinary screw socket, which gave good contact with great facility of handling.

The Woodhouse & Rawson lamps displayed good work-

manship and were quite simple in construction. The carbon, which is rectangular in cross section, is cemented by a very neat joint to two platinum wires, which are kept apart by a glass bridge, and then passing through the base of the lamp have small loops formed in their ends, the loop being made rigid by imbedding the ends in the glass. Two spring hooks in the socket hook into these loops, making contact. The lamps in the test were used with Swan sockets. The loops at the base of the lamp seem liable to injury. Two lamps were disabled by the breaking of these loops before the beginning of the test for duration. No information as to nature of the carbon was in possession of the committee. Each lamp had the firm name marked on the glass.

The Stanley-Thompson lamps had carbons apparently made from thread. No information was given other than that the lamps were made under the Stanley-Thompson patents.

The small, or 44-volt lamp, was well made so far as the glass work was concerned, the carbon being cemented in platinum wires, which were kept apart by a glass bridge, and then passed through the base of the lamp. The glass bulb of the lamp was set in a hollow in a wooden base, and most insufficiently secured by a cement apparently of plaster of Paris. The wires went through the wood to two small screws. Much difficulty was caused by the cement giving way, so that the wires formed the only attachment of the lamp to its base. The lamp was secured in its socket by two brass bars projecting from the sides of the wooden base fitting into slots in a brass cylinder socket. Connections were made by two springs at the bottom of the socket pressing against the screws in the base of the lamp. The sockets were not satisfactory, not being interchangeable readily, and difficulty was constantly met with in shifting the lamps. Several cases occurred of partial carbonization of the wooden base between the wires, causing bad leaks, and in one case

it had gone so far as to attract attention by the wool's smoking. The wooden buses were blackened, and the leak may have begun over this blackened surface. The difficulties met with in the 44-volt lamp were also encountered in the 96 volt. In addition, there seemed to be a point of weakness in the base of the glass bulb, several of the globes breaking at that point after the cement gave way. These accidents occurred in fitting the lamps to their sockets for the test of duration.

All of the above lamps, except the Edison, bore evidences of the carbons having been "treated" by a deposit from a hydrocarbon gas. The deposit on the Weston carbons was but slight.

After the test for duration had continued about five hundred hours, the Franklin Institute entered three new lots of lamps, as already stated. These were:

10 Weston lamps (paper carbon).....	70 volts.
10 Woodhouse-Rawson lamps.....	50 "
10 White lamps.....	50 "

The Weston lamps were the same in general appearance as the 1104-volt lamps. The carbon, it is understood, is made from paper and subsequently treated to very heavy deposits from a hydrocarbon gas.

The Woodhouse-Rawson lamps were received indirectly from the manufacturers, and were similar in appearance to those already tested, but were more uniform.

The White lamps were somewhat similar to the Woodhouse-Rawson in external appearance, but the bulb was somewhat longer and narrower. The carbons were cemented to platinum wires, which were separated by a glass bridge, and had loops in their ends for hook connections in a spring socket. No details of the manufacture of these lamps were furnished.

The currents were furnished by an Edison "T" dynamo,

worked by a Porter-Allen engine, kindly loaned for the test by the Southwark Foundry. Steam was obtained from a locomotive boiler, the property of the Franklin Institute. The potential was controlled by a Weston automatic regulator, which kept it within about a volt on either side of the normal. Three Edison bridge indicators were in use in different parts of the circuit. They agreed in their indications, and proved to be very sensitive. A registering telemanometer recorded all variations of steam pressure with great accuracy.

Although the code called for preliminary measurements for the obtaining of the reduction factor only, it was thought best to make electrical measurements as well, that the efficiencies of the lamps might be obtained in watts per sperical candle, and comparison instituted between the different lamps under test.

#### PHOTOMETRIC MEASUREMENTS.

The Methven standard two-candle slit was used in all the photometric measurements.

Standard English candles, a candle balance and stop watch were used in the comparison.

Ten series of five-minute observations showed an error of one per cent. as the result of 100 observations.

#### ELECTRICAL MEASUREMENTS.

The galvanometer was loaned to the committee by Prof. H. D. Todd, of the U. S. Naval Academy, and the reading telescope by Messrs. James W. Queen & Co., of Philadelphia, who (through Mr. Walton, the head of the Philosophical Department), extended to the committee throughout the test every convenience that their large stock of physical apparatus afforded.

## CURRENT.

The weighings were made on a balance made by Troemner, of Philadelphia, to tenths of milligrammes. The weights used were verified by comparison with a set of standards in possession of Mr. Troemner.

The error of the galvanometer in reference to the law of tangents was also calculated by the formula given in Kohlrausch's Physical Measurements, and also by Maxwell's formula.

A Kew magnetometer was kindly loaned by Prof. C. F. Brickett, of Princeton.

## RESISTANCE.

The ohm was by the scale to be the Paris or legal ohm. In reproducing it the committee had access to the standards and apparatus of the Johns Hopkins University, used by Prof. Rowland in his recent determination. The standard resistances of the test and the Wheatstone bridge used had their values carefully determined in Baltimore.

In the reductions the legal ohm was taken as 1.0112 B. A. units.

## ELECTRO-MOTIVE FORCE.

The volt was determined by the fall of potential in a given resistance due to a known current.

The resistance of the reel was determined, on January 5th, at the Johns Hopkins University, as 21.089 legal ohms at 15.2° C. The reel was then placed in turpentine in the exhibition building, and remained for three weeks before the efficiency measurements began.

## MEASUREMENTS OF EFFICIENCY.

The committee is indebted to Mr. C. H. Small, of the

University of Pennsylvania, for the averaging of results and the construction of the light curves.

## WESTON LAMPS (110 VOLTS).

In submitting a report on the tests of these lamps, the committee think it proper to give a résumé of correspondence between Mr. Weston and themselves. The 110½ volt lamps were received from the United States Company in January. Efficiency measurements were made on the 5th, 6th and 7th of February. On the 18th of February, Mr. Weston visited the exhibition building, was shown the results of the efficiency measurements on his lamps, examined into the installation, and the working methods of the test, and thinking the candle-power of some of them low, addressed the following to the committee:

PHILADELPHIA, February 18, 1885.

Having examined the methods of testing used and the results obtained in the efficiency determinations, I would request a re-measurement of my lamps numbered 4, 6, 9, 10 and 17.

I am satisfied that the methods used are such as will produce correct results.

EDWARD WESTON.

The lamps designated were re-tested and the accuracy of the former measurements verified. On the 7th of March the preliminary run for working methods began. Owing to irregular working of the engine, causing flickering in the lamps, it was prolonged a week, that better working might be secured. On March 17th the committee had arranged to begin the duration test at 2 P. M. Very shortly before that time, the representative of the United States Company, who had not been in attendance on the tests for several weeks, although his presence had frequently been solicited, arrived with the following letter from Mr. Weston:

LABORATORY OF EDWARD WESTON, 107 ORANGE STREET,  
NEWARK, N. J., March 16, 1885.

PROF. Wm. D. MARRIS:

DEAR SIR:—The very marked difference in candle-power of our lamps, as shown in the tabulated results of the tests made in Philadelphia, surprised me very much, particularly as our lamps are remarkably uniform in this respect, and must necessarily be so when properly made, owing to the precise method of treating the lamps.

After arriving here I commenced to investigate the matter, and soon found that you had been supplied with a singularity bad lot of lamps; the defect being due to imperfect tacking of the loops. This has been so imperfectly done that you will find it impossible to maintain the candle-power uniform for even a very short period of time without increasing the E. M. F.

The resistance of the loops will rise rapidly, and the lamps will rapidly deteriorate and fall in such a short time, as to leave no doubt in your mind that if we made such lamps regularly we could not possibly continue to do business. In other words, the lamps are thoroughly worthless.

In view of these facts, I think it is useless to spend any time on the lamps of our make which you now have, and since there is an provision in the Code for such a contingency as has arisen, I respectfully submit this statement of facts to the committee, and ask for a careful consideration of the matter.

Deeply regretting that anything should have occurred on our part to still further prolong and increase the cost of a series of tests which must necessarily be very tedious and expensive, I remain,

Yours, respectfully,  
EDWARD WESTON.

The members of the committee present agreed with Mr. Weston that the Code provided so remedy for a case of this kind, and agreed to postpone the beginning of the test and to refer the matter to the Edison Company, that the competing parties might enter upon new arrangements. The Edison Company, through Mr. Upton, agreed that Mr. Weston should have the privilege of entering another lot of lamps of the same general character and grade as those already tested, and the committee desirous of obtaining good lamps for test, agreed to measure them when received. On the 1st of April a conference took place between Messrs. Weston and Upton,

the president of the Franklin Institute and a portion of the committee, at which Mr. Weston stated he thought there would be no doubt but that the new lot of lamps would be on hand within a week. The allotted time expiring without anything being heard from him, the following letter was sent:

PHILADELPHIA, April 8, 1885.

MR. EDWARD WESTON, Electrician of the U. S. Electric-Light Co., Newark, New Jersey:

DEAR SIR:—Since your letter of March 10th, 1885, the committee of the Franklin Institute appointed to conduct the competitive duration test of electric incandescent lamps have been awaiting the receipt of other lamps to replace those which in your letter you condemned and pronounced worthless. Our letter of the 11th ultimo conveyed to you an expression of our willingness to undertake the additional labor necessary to test a new lot of lamps. Hearing nothing further from you regarding lamps, we telegraphed for date and received no reply on March 20th. On March 26th, a fortnight later than your letter, we wrote to say that the tests would begin April 3, unless some sufficient reason for delay was assigned. At our verbal conference of April 1st, our understanding was that your new lamps would certainly reach us by today. We again telegraphed you yesterday afternoon. The engagements of some of the members of the committee will prevent the completion of the duration test if further postponement occurs. In justice to the Franklin Institute, this test must be completed.

The committee in the absence of any reply relative to our telegram of yesterday, feel compelled to fix Saturday the 11th, current, as the date beyond which further postponement is impossible. This will have given you twenty-five days in which to replace lamps pronounced worthless in your letter of March 10th. The committee have stretched the allowable time of delay to the utmost and regret the imperative necessity which forces them to fix a limit to it.

The committee interprets your letter of the 10th as a withdrawal of your lamps of the 40 grain (110 volt.)

If new lamps of similar grade are not received by Saturday forenoon, April 11th, the duration test will proceed without your lamps and the United States Electric Light Co. will not be regarded as a competitor. The 70 volt lamp now measured will, however, be tested as a matter of scientific interest, but not in competition with other lamps.

We regret that circumstances force us to make this decision, and will

be more than pleased to have you enter as a competitor. Our limited time and means will not permit further delay.

I am, very truly yours,  
WM. D. MARKS.

This letter was written with the knowledge of only a portion of the committee, who assumed that the Edison Company would not compete with lamps pronounced worthless by their maker.

On April 9th another conference was held at which the representative of the Edison Company objected to Mr. Weston withdrawing his lamps, and addressed the following letter to the committee:

PROF. Wm. D. MARKS, Chairman:

DEAR SIR—The Edison Company desires that the test of lamps be proceeded with under the Code without further delay.

Respectfully,  
FRANCIS H. UPTON.

65 FIFTH AVENUE, April 9th, 1885.

This request that the test should be continued under the Code, the failure of Mr. Weston to provide new lamps, together with the impossibility of further delay if the test was to take place at all, gave the committee no option but to proceed under the Code with the lamps on hand. In order to prevent any misunderstanding on the part of Mr. Weston, he was notified by letter and telegram that the test would begin on the 11th. A few hours after the beginning of the test the following telegram was received:

PROF. WM. D. MARKS,

Your telegram surprised me. The lamps have been withdrawn. Our position in this respect is fully caused by your letter of April 8th. I presumed that this was the final judgment of the committee pending a reply from me. There is no clause in the Code by which the Edison Company can compel the committee to proceed as indicated in your telegram, neither the committee nor the Edison Company have any right to re-enter

our lamps without our consent. My letter in reply to yours of the 8th will fully cover these points.

EDWARD WESTON.

The matter was immediately considered by the full committee and answered as follows:

PHILADELPHIA, April 11, 1885.

EDWARD WESTON, Newark, New Jersey:

In reply to your telegram of today the committee have considered the question you raise. It was understood by them that the verbal conference of Thursday evening at which you were present made it clear that the formal demand of one of the competitors that the test should proceed, left the members of the committee then present no option in the matter and rendered the letter of the 8th nugatory. Under the provisions of the Code any question between the contestants and the committee can be settled by a unanimous vote of the committee, and the undersigned give their decision that under the Code no withdrawal is possible, and their letter of the 8th becomes invalid when questioned by a contestant.

J. B. MURDOCK, G. M. WARD,  
L. DUNCAN, WM. D. MARKS.

Subsequently another letter was received from Mr. Weston and another conference held at his request, but the committee regarded their action as final and nothing was done.

The committee present the above as a matter of justice to Mr. Weston and also as an explanation of their own course of action.

Reference has already been made to the peculiar form of the Weston carbon. The light curves were very similar in form in all the lamps. In one, the major axis of the curve of horizontal illumination lay in the direction of 30°-210° instead of in 380°-150° as in the figure. In making up the average of twenty, another lamp was substituted for this one.

The results of the preliminary efficiency measurements are given in the following tables and diagrams.

## WESTON LAMPS (70 VOLTS).

Mr. Weston having expressed a desire to have measurements made on a lot of 70-volt paper carbon lamps, they were entered by the president of the Franklin Institute for test. The distribution of light is almost exactly the same as in the other lot. Ten lamps were selected from a lot of thirty-three received from Mr. Weston, tested for efficiency and afterwards subjected to a duration test of 523 hours.

In addition to Mr. Weston's approval of the methods adopted in the test, as stated in his letter of February 18th, the committee received the following:

PHILADELPHIA, March 6th, 1885.

Having examined the methods of testing used and the results obtained in the efficiency test now being made by the Franklin Institute, I am satisfied that the methods used are such as will produce correct results.

FRANCIS H. UPTON.

PHILADELPHIA, February 13, 1885.

Having been personally present during the determination of the efficiency of the lamps entered for the duration test, and having examined the instruments used, the methods pursued and the operations of the experimenters, I am of the opinion that the tests are fairly conducted and that the methods used are such as to produce correct results.

JOHN W. HOWELL.

## RESULTS AS TO "DECIDED" SUPERIORITY.

## 1065 Edison Test.

Woolhouse & Havens.....	Wedges. All out of 11 Lamps.
Weston (U. S. Co.).....	" 17 " " 24 "
Stanley-Thompson.....	" 19 " " 22 "
Edison.....	" 1 " " 21 "

## Note:

Edison.....	Lost 5 1/2 % in 1065 hours.
Weston.....	" 65 1/2 % " " "
" Second Trial.....	" 39 1/2 % in 600 hours.
".....	" 69 1/2 % " 1000 "

## PREJUDICE VERSUS FACTS.

We print the following editorial from the New York "Electrical Review" of October 24th, 1885. As the title of the above paper would indicate to the average reader the publication of true statements bearing on the subject of electric lighting, it is evident that the interests of the proprietors lie in the direction of such a perversion of facts as to show a decided malicious intent which should not be tolerated in honest journalism.

## Prejudice.

## SUCCESS OF THE INCANDESCENT LIGHTING COMPANIES.

Of all the progress made in the electrical field in recent years, the work in incandescent lighting, that of the Weston, of the Brush-Swan and the Sawyer-Mann companies is at once the most pronounced and gratifying. Beginning, as they all did, under most unfavorable conditions, with a public uninforming as to the advantages of incandescent lighting, and a greedy and slow-going rival to fight, they struggled on, step by step, until now they have beaten away the obstacles that stood in their path, and by sheer superiority of apparatus and straightforward business methods forced their way to the front.

They begin their work modestly, making no rash promises that could not be realized, and having prediction and prophecy for the prophets. When they found they could get a certain number of incandescent lights with a certain horse-power, they offered to take contracts to do this and no more, and thus, keeping within the bounds of practical feasibility, they performed what they promised, and got a reputation for consistency and thoroughness which has remained to them to this day.

It is curious to look back upon the struggles of these companies, and watch them as they improved their processes, while, at the same time, beating back what was then a powerful rival, but has grown weaker and weaker as they have advanced. The United States and the Swan Companies had many a tussle with this rival concern. The latter company boasted it so thoroughly in England that it grew has sunk to a palisade white, and the Sawyer-Mann Company fairly and squarely beat it on its own ground here in America. This company, that would like to have posed as a monopoly, has been compelled to flinch its claims in the incandescent field.

It cannot make the public pay it tribute for using a natural product that was discovered before its name emerged from obscurity.

Had it succeeded in this, it might, perhaps, before it got through have succeeded in making us pay it a royalty for the enjoyment of the light of the sun and the moon and the stars.

Under such extortion, life is an expression of Mr. Mantalini's—would be only one "damnation grant."

Fortunately, this was not to be, and today the best incandescent lights to be found in the country are furnished by the rival companies—the Brush-Swan Company, the Weston-Maxon Company and the Sawyer-Mann Company. There is still another light for which much is promised. It is the invention of Dr. Morse, and is said to be a striking improvement on the Edison light.

The advantages possessed by the "Swan" and the "Weston" and the "Sawyer-Mann" incandescent lighting systems must be easily apparent to all practical business men. Besides the excellence of the lights themselves, the system of distribution cannot but commend itself to the consumer, and we take it that the consumer has something to say.

In isolated lighting the superiority of these systems has been demonstrated an hundred times here in New York City.

Many great buildings belonging to wealthy corporations and individuals have been furnished with one of these systems that we have named, after a careful comparison had been made with the others that exist.

Projectors visiting New York should not fail to examine the "Weston," the "Swan," the "Sawyer-Mann," the "Schuyler" and the "Mottler-Parkins" incandescent systems of lighting.

#### Facts.

A partial list of the United States Electric Lighting Co.'s plants recently shut down, taken out or replaced:

U. S. Post-office, Chicago, Ill.	.....	Shut down.
Chelsea Place, N. Y. City	.....	Shut down.
Seaver & Van S. Hayes	.....	Taken out.
Wells Building, N. Y. City	.....	Shut down.
Harry Miner's Theatre	.....	Replaced by an Edison plant.
Harry Miner's Eighth Avenue Theatre	.....	Replaced by an Edison plant.
Harry Miner's People's Theatre	.....	Now lighted with an Edison plant.
Des Moines E. L. Co. (69 L.)	.....	Replaced by 5,000 Edison lights.

Hoffman House, N. Y. City.....Replaced by an Edison plant.  
Chicago, Milwaukee and St. Paul H. R. Shops at Milwaukee.....

Replaced by 500-light Edison plant.

Detroit "Free Press".....Increased by the Edison Co.  
C. A. Pillsbury (A Mill), Minneapolis, Minn.....Edison increase 500 lights.

G. Valois League Club, N. Y. City.....Taken out.

G. Caswell, Hazard & Co., N. Y. City.....Taken out.

G. Theodore B. Starr, N. Y. City.....Taken out.

New York Stock Exchange, N. Y. City.....Taken out, now 300 Edison lights.

Metropolitan, N. Y. City.....Taken out.

Pick & Hatch, N. Y. City.....Taken out.

"Commercial Advertiser," N. Y. City.....Taken out, now Edison lights.

First National Bank, Chicago, Ill.....Taken out, now Edison lights.

Morse's Mill, Lowell, Mass.....Taken out, now 250 Edison lights.

"Boston Herald," Boston, Mass.....Taken out, now 600 Edison lights.

#### DEFUNCT BRUSH INSTALLATIONS.

Cincinnati Water Works.....Taken out.

Third Avenue Theatre, N. Y. City.....Replaced by an Edison plant.

Fidelity Loan, Trust and Safe Deposit Co., Phila., Pa.....

Replaced by an Edison plant.

There are a few others still in the experimental stages.

#### SAWYER-MANN PLANTS.

The Mutual Life Insurance Co. has been shut down.  
They have a few other plants on trial.

#### MATTIER INSTALLATION.

The Grand Opera House, Chicago, Ill., has shut down.  
They have no other plants in operation.

(NOTE).—In the Edison system two wires, or a continuous metallic circuit has always been the practice. Initiators of this method had, as at the time claimed by them in their first installations, a more economical and superior way of doing it, in which only one wire was required. A few of such in-

stallations are noted above, marked G. This was effected by grounding one wire on the gas or water system. It was finally found best by these novices to use the Edison method, viz., "metallic circuit." As this alone does not constitute a system, the above-noted unsuccessful plants will indicate that they still lack many other essential factors besides piracy.

EDWARD H. JOHNSON,  
President.

No 11.

## BULLETIN FOR AGENTS.

THE EDISON COMPANY FOR ISOLATED LIGHTING,

65 FIFTH AVENUE.

NEW YORK, NOVEMBER 24, 1885.

### HIGH PRESSURE CURRENTS.

Mr. Charles Lever, in a communication to the English "Electrical Review" of October 31st, 1885, has the following to say on the above subject:

• • • But, it is this eternal desire to get as many jumps in series from one machine as is possible, which no doubt prevents such a course from being adopted in regard to increment of current. Whatever may be the advantages of this high tension supply system, they are completely nullified by the element of danger introduced thereby. Despite all that may be argued to the contrary, men will continue to be killed in the future as in the past by such systems. During the past two or three years the electromotive force of certain dynamos has risen. In America, from 2,000 volts to 3,000 volts. In other words, 40 lighters have given way to 60 lighters. The danger already exists and would not be greater even if 100 lighters are built in the future. • • • Before leaving the subject of arc lighting, some reference ought certainly to be made in regard to its latest development in the United States, i. e., the tower system. A very few words will suffice on this point. If any one wishes to light so many acres of prairie land in Nebraska, or so many square miles of sage brush plain in Nevada,



then by all means let them adopt the tower system. But, for lighting a city, it is altogether a failure. Is a city we want light, not mere moon-light effects, accompanied by weird and fantastic shadows.

In regard to the development of the incandescent light in the United States, some years ago the late Mr. Sawyer, in conjunction with Mr. Mann, introduced an electric incandescent light system, in which a small carbon pencil was rendered incandescent in a glass globe containing hydrogen. This Sawyer-Mann system, as it was called, never made much headway. Indeed, it was not until Mr. Edison showed us the direction in which we were to work in order to make the incandescent system a practical undertaking and a commercial success, that any headway was really made.

Although the incandescent lamps themselves are no more efficient in America than they are here, yet, on the whole, incandescent light installations are there carried out in a much better manner than those in this country. In the States we don't find manufacturers claiming an efficiency of 24 watts per candle-power, but they supply good, substantial and durable lamps, giving an honest standard candle-power. Neither do we now, others deal with refuse, some almost ready to burst with brilliancy. Probably this fact is to be attributed to the better methods of gauging filaments in America. That attention to detail, which has been lacking in our lighting, has been bestowed in the railway on incandescent lighting. The incandescent lampholders and fittings in the United States are altogether more substantial than those in England. Where have we a really substantial connection, in this country, for lampholders, with the exception of the Edison holder? The fact is that we want, in our incandescent light installations, more of the substantial and less of the flimsy, more of the practical and less of the theoretical, and more of the actual and less of the 105 per cent. efficiency business.

As regards working are and incandescent lights together, it is an unfortunate thing that we, in England, have already advocates and adherents of the high tension supply system. During the past two years, a system has cropped up in the United States, whereby incandescent lamps are worked on the same circuit as the are lights by means of high tension currents. An automatic arrangement is provided with each incandescent lamp, so that in the event of said lamp giving out, a resistance equivalent thereto is thrown in circuit. It is a system which has not made much headway, and it is to be hoped that it never will do. Notwithstanding the theoretical "look" which has been put forth by the advocates of the high tension system in this country, the practical electrician knows perfectly well that this is not the field to work in, if we are to make a success

of our future electric light supply stations. As already stated, Mr. Edison has led the way by making his supply station in New York a practical undertaking and a commercial success. If we wish to be successful with the future electric light supply stations in this country, we should act wisely by following in his footsteps. And, when these lighting stations have developed into undertakings of any magnitude, the supply of electricity must eventually fall into the hands of the municipal authorities—as in the case of gas and water undertakings—in order to secure the best results for the public benefit.

#### ART GALLERY LIGHTED.

The following is from *Yanowin's* "Sunday News," Milwaukee, Wis., September 19th, 1885:

#### The Light of the Future.

Victoria to the art gallery notices, upon entering, the soft, mellow light used in this department as being entirely different from the dazzling brilliancy in the main building, although the lights, like the larger lamps, are fed by electricity. The Edison Electric Lighting Company, of Chicago, have a plant in the basement on the east side, which supplies the 320 lamps used in the art gallery, and 20 lamps at the Milwaukee and St. Paul Railway exhibit, using an Armstrong & Sims 25-horse power engine, which makes 320 revolutions of her wheels every minute, a speed that if allowed to run on at a railroad track, would reach Chicago in less than 30 minutes. A small dynamo of 300-horsepower capacity is run at the rate of 1,200 revolutions per minute. The Edison electric light is the light of the future. The day is not far distant when these lamps will take the place of gas jets in stores, shops, factories, public buildings and private residences. Private plants are already placed in the Philip-Hart Brewery, Franklin House, County Hospital, Bussey Ashton and one grist mill in this city, and negotiations are on foot for other plants. The Edison light is a positive luxury (it costs no more than gas), is perfectly safe, emits neither odor, heat, nor discoloring gases. When the lamp breaks the light goes out, so there is no possible danger from fire. The same steady current which supplies life to the lamp can be taken through the system without injury; feeble plugs are placed at all points where the line enters a building and an overcharge

current merely fuses the plug and cuts off the connection before any damage by fire can occur. Every light in a building can be regulated from one or more switches, or each lamp can be controlled separately. The electric current is measured by a meter arranged for that purpose, which works upon the same principle of nickel-plating wherein a piece of metal at the negative pole is placed in a solution with a piece of nickel at the positive pole, the current is closed and the nickel is transferred to the metal. A careful weighing afterwards shows that all the weight the current is required to transfer a gramme of metal, and by using carefully to a further weight how much electricity has been used. The meter can, if no change can take place on the plates. For safety working in combustible material, chemical works, or other dangerous localities, it is perfectly safe, as the lamp may be plunged into an open barrel of gasoline in a vacuum and the instant air touches the carbon the light goes out. A lamp may be placed on a lady's handkerchief while lighted and broken, but so quick is the light extinguished that the face will not be even soiled.

#### LIGHTING THE CITY.

The following editorial is from the Detroit "Free Press," October 21, 1885:

\*\*\* So far as economy and effectiveness are concerned the incandescent system is far superior to the arc. The latter gives a brilliant light over a large space, but is liable of subdivision to advantage. It could be made more effective than it is on the towers by using single lamps at the street intersections; but it would not even then be as effective as incandescent lamps more numerous distributed, and so placed as to light the streets under the trees. In summer as well as in winter. The incandescent is also a more pleasing light in every way, and far less likely to prove injurious to the eyes. If the electric light is to supersede the use of the incandescent lamp for street lighting is not a mere theory. There are several of them in the city, including an excellent one on the Free Press building, which shows how thoroughly a block can

be lighted with a single lamp. It has been tried, moreover, in other cities and found to work admirably. The City of Lawrence, Massachusetts, is now lighted wholly with incandescent electric lamps, and those most deeply interested are lost in their approval of the system. The city has eighty miles of streets, and is lighted very successfully by 481 lamps, run by two dynamos. The cost is some \$28,000 per annum.

#### THE EDISON LIGHT IN BELGIUM.

We are informed that the Compagnie Edison de Paris are about to concede to the Soci  t   Anonyme des Ph  nix, at Ghent, an exclusive right to the exploitation in Belgium of the Edison system for the generation and maintenance of the incandescent light and the transmission of power. The Soci  t   Ph  nix have already installed 1,200 lamps in the important manufactory of M. Ferd. Lounberg, at Ghent, an experiment which, as gas is very cheap in that place, is being watched with great interest.

#### THE LIGHT OF THE FUTURE.

"Peck's Sun" of October 24th, 1885, contains the following editorial:

It seems strange to are reasonably enterprising men in any city that is not bankrupt, or running down, oppose lighting a city with the electric light. Take the cases all over the country where electric light has been proposed and rejected, and it will be found that the gas monopoly beats the electric light. The gas monopoly in any city is old, and like the cancer, it has firmly taken root and has its fangs around a city and its rulers before they know it, and it clings more tenaciously, and shakes its victims without heed to their cries. A gas monopoly is usually owned by the "best citizens," who do not ask questions as long as they receive big dividends. They employ unscrupulous tools to do their dirty work, and the truly good monopolists go to church and pray, while the tools stay in the office and screw the last cent out of victims. There is no business that is run so much like Ferdinand Ward's plan. Stockholders in great cities are unknown except to the Ferdinand Ward who divides the spoils.

If the dividends are large, the particular Ferdinand who is responsible receives a smile of approval from the limited son of luxury who takes his share of the spoils. The idea of stockholders is to employ men, if possible, who, if they have souls, have not got the souls with them. Men who would watch a delinquent and turn off the gas just as the family were rent and relations in Ireland; the gas companies of the United States have a record that is worse than the landlords of Ireland by a great majority. Gas companies have no friends, my where on earth, except those who are in their power, either about for money, or in some manner in their clutches. No other branch of business is so centrally hated by all its customers. And why? Because the belief is general that the meter is a believed to combine to rob cities, business men and individuals. This is the belief, whether it is true or not. Customers will show that a gas bill goes right on whether a house is lighted or not, frequently. It seems to me not whether gas is four dollars a thousand, or two, the gas bill is not expert, and all are at the mercy of a machine meter, which seems to work. The business is one that no one understands, neither consumer do he "metering" in the interest of the most soulless monopolies in the world. Customers kick more about gas than anything they consume, and they get less satisfaction than they would get of the James Brothers. A man goes to a gas office in any city and makes a complaint, and the man in charge talks to him without looking up from his book. The feeling a customer has is as though the Strongman bottle behind the desk had said, "Well, what are you going to do about it?" And what can he do about it? He doesn't want to burn kerosene, he can't buy gas of another company, because there is none, or if there is one, it has "pooled" with the monopolies and on the make, a man is so much in their power as the people are barrel from organizing a new company. The old company streets. The courts would sustain the hole could be dug in the building wall, had the law on its side, though no justice. The electric gas companies, and public men want to look well and canvass thoroughly before they stand in the way of the new light, at the bidding of gas companies, and public men want to look well and canvass thoroughly before they stand in the way of the new light, at the bidding of gas companies, and public men want to look well and canvass thoroughly before they stand in the way of the new light, at the bidding of gas companies. Though many citizens of a large city may have no use for electric light in their homes or business places, they want the light to

be given a chance against the gas monopoly. They may use gas as long as they live, but they want the electric light to be established, that it may take its chance with the old gas that has been so tyrannical and cruel. A city that is bankrupt, or that never expects to be any greater than it is, may be excused for taking little interest in electric lights, or telephones, and it may get along without pavements or sidewalks, but a city that has a future before it, a city that is not dead and buried, a city that can erect five million dollars worth of buildings in a single year, as Milwaukee is doing this year, a city whose beauty and wealth is the talk of two continents, cannot afford to allow a small gas company to prevent its being lighted with electric light if it wants to, and those who stand in the way of the will of over a hundred thousand people are liable to be walked on. The people demand, not electric light, but the privilege of using it if they want to, and no filibustering, or technical objections, will stop the progress the people want, except temporarily. No man or company is greater on their ears, and become real mud, somebody will turn pale and say, "O, I was in favor of the electric light all the time." Milwaukee is like a ruthlessly beautiful machine, and she shows off better in a fine light, and she will have it, and put on style. The handsome woman in the world would look pale by the light of an unsumptuous tallow candle. A beautiful city looks very ordinary by poor gas-light beside cities that shine in the electric light.

#### THE FIRST INSTALLATION OF THE ELECTRIC LIGHT IN A LONDON CLUB.

We take the following extract from the London "Court Journal," October 18th, 1885:

The Naval and Military Club, Piccadilly, has earned the distinction of being the first club in London with sufficient confidence in electricity to adopt it as its means of lighting.

Undoubtedly this marks an important era in the growth of this young illuminant. Hitherto it has only flourished here and there in a few country houses, hotels, or public resorts, but now, having invaded the precincts of club life, it may be said to have speeded further on the road of public favor and the confidence then placed in it must surely tend to at once bring about its more general adoption.

The engineers and contractors for the whole work are Messrs. B. Vennart & Sons, of Coventry Gardens, London, who also have the contract,

among others, for the lighting of the New Constitutional Club, Northern-berland avenue.

No trouble or expense has been spared, and all the most recent improvements added, so as to render this installation one of the most perfect and efficient yet completed.

Considerable difficulty was at first experienced in procuring suitable space for the electric machinery, but with the removal of some old stables in the rear a substantial engine-house, with every requisite, has been erected by the contractors. Two steel multitubular boilers, with engines of the compound type, and fitted with automatic gear, have been specially manufactured by Messrs. Davey, Paxman & Co., who have achieved such success with their engines at the Exhibition of the "Heraldships" and "Javelinas." The two substantial dynamos worked off the large fly-wheels have been manufactured in New York by Mr. Edison, at a special slow speed, for this Club, and have fully come up with the high satisfaction formed of them.

Either of the engines or dynamos are sufficient for the whole present electric lighting of the club, and they are coupled up so as to give the most complete reliability.

The lights are at present fixed throughout the whole of the club proper, and in some other departments, notably the kitchens. In the principal rooms they are mostly fixed in elaborately etched and cut glass vases of "Adams" design, suspended from the ceiling, and cast a soft and well-diffused light round. The work of laying the wires has been a difficult one, owing to the character of the decoration, and the necessity of the wires being completely hidden. Switches are provided for turning on and off the various rooms in sections, and the requirements of the Insurances have been met by not only putting safety fuses on the one electrical pole of the wire, but on both positive and negative. All the wires are covered with no less than four separate coatings of insulation, and are protected by ornamental wood moldings. The incandescent lamps used are of the Edison type.

There is no doubt that this important installation will soon be followed by many others of like character.

#### FACTS VERSUS PREJUDICE.

Referring again to a biased editorial in the New York "Electrical Review" of October 24th, 1885, on "Success of

the Incandescent Lighting Companies," we print the following editorial and news item, together with letters from the Pittsburgh Electric Company, all of which appeared in the New York "Electrical World" November 7th, 1885.

We were recently called upon to take up the defense of are lighting against unfair attack, and it will be seen from the correspondence appearing in this issue that an appeal is now made to us in behalf of incandescent lighting. The Pittsburgh Electric Company, whose letters we publish, is engaged, among other things, in putting in electric light plants, both are and incandescent, and feels aggrieved that its business interests in the incandescent field should be thus wantonly attacked when the undeniable facts show the assertions made to be utterly without foundation. The inference drawn by the Pittsburgh Company as to the motives that instigate the attack must be accepted by every thinking and far-sighted man as perfectly justifiable. If it a great pity that incandescent and are lighting, now gaining ground so hopefully and cheerily, should be abused and derided by the very papers that ought to be the first to assist in making electric lighting a success. The question the Pittsburgh Company asks is: Has a company the right to determine for itself whether or not it is to its advantage to advertise, and, if so, may not it confine its advertising to such journals as it can advertise in profitably? Must it either pay tribute to every scribbler who marks it for its victim, or else submit to be made the subject of scandalous and unfounded attacks? The evil is more prevalent than many believe, but papers resorting to such methods are soon found out, so that what they say has no weight except among those who are unacquainted with their character.

#### Progress of Incandescent Electric Lighting in the United States.

A few numbers ago, we quoted some of the statistics of the growth of the Edison Company's business. An analysis of the last figures compiled, shows in an even more striking manner the rapid advance of the Edison system in popular favor. The figures are given in the minutest detail, so that one can see at a glance the location of the plants, the size, and its function. Making a summary of the various tables, we find that of isolated Edison plants in the country at the present hour, owned and operated by the purchasers themselves, there are no fewer than 525 with 192,375 lamps.

In the "American Electrical Directory" for October, 1884—a publica-

tion whose statements may be taken as approximately correct—there appended a list of isolated plants, showing a total of 421 plants and 74,464 lamps, of which 569 plants and 76,422 lamps were of the Edison system. The company has, however, as above shown, increased its output to 520 plants and 119,375 lamps up to October 1, or an increase, taking this basis of 41 per cent. on plants and 59 per cent. on lamps. It is also worthy of note here that there are in use 84,000 lamps, additional, in central stations devoted wholly to the work of supplying the public in the same manner as do gas works. Another interesting feature of the work of the company in 1884-5 was the number of installations in exhibitions. The list is given as follows: Louisville, 4,000 lamps; St. Louis (Germaessent), 3,000; New Orleans, 5,000; Cincinnati, 1,500; Boston, 1,500; Milwaukee, 800; Philadelphia, 3,000. No more need be said to demonstrate the success of the company, and the fact that incandescent light has not only come "into stay," but to see other methods of artificial lighting fall into disuse.

#### Success of Incandescent Lighting Companies.

The subjoined correspondence explains itself. It will be observed that the matter reached us as time for last issue. We preferred, for obvious reasons, to wait a week before publishing it:

*To the Editor of the Electrical World:*

Sir—We herewith inclose a copy of a letter which we sent to the "Electrical Review." We ask you out of justice to the readers of electrical papers, to publish the same so that they might know how it is that some strange things appear in print.

We send this to you with our request, for its publication, because we know that there is no other electrical paper better fitted to have the matter appear.

Respectfully yours,

PITTSBURGH EXHIBITION COMPANY.

Pittsburgh, Pa., Oct. 24, 1885.

*To the Editor of the Electrical Review:*

Sir—We have received and read your issue of today's date, and were very much disappointed with same, so much so, in fact, that we wrote your journal, and at once forwarded us our bill up to date. We had been subscribers to every electrical paper published up to the first of April last, when we discontinued all save "The Electrician," "Western" and "Eleven." We continued with you because we thought you were so honest in your editorial expression as "The Electrician," "Western" is. We find in your issue of today that you are not, but that there is a want of principle about you, or else such expression is the cause of ignorance on your part. While there is no such claim of the two for you, who claim to run a first-class independent trade paper, it certainly would be more satisfactory to your subscribers to have you acknowledge your ignorance than to allow them

to reach the opinion later that your editorials are written as they are published, and do not represent your honest opinions.

We have particular reference to the editorial in the issue above mentioned, headed, "Success of the Incandescent Lighting Companies." We read this and then found that you indicated every system of incandescent lighting that had their card advertised in your very valuable paper. We inclosed over your paper several times in the advertisement of the Edison Company, and we then came to the conclusion that since they did not sue Company, and for advertising their system is known inferior to those that do, you must be for advertising their system to have our eyes that up by any such scheme as the one above mentioned.

Understand, we do not write you to length on this matter, because of a fear on our part that the article will have my effort upon the further success of the Edison kindred (that will stand on its merits, as it always has done), but simply to show our disgust and displeasure at the transparent and unbusinesslike method of procedure taken by you. We are convinced that all people will reach the same conclusion that we have, it only being matter of time with them, as in disposition of this kind in trade journals is early tested by its patrons. Besides this, how much weight can be put on your other articles, when one knows how and why this one was written. No doubt these few words depend on you to slunge and fix their stings on the leading question will be apt to feel happy when they learn of this.

We know that you know exactly the relative merits of the different systems of incandescent lighting, and know all about the life of the different make of lamps, as well as the economy and efficiency of the different systems complete. We would, therefore, very much like to hear something in your defense of this apparently unbusinesslike matter.

Respectfully yours,

PITTSBURGH EXHIBITION COMPANY.

#### RETROSPECTION.

In Bulletin No. 10, attention was called to the admissions made by Du Moncel, Proce and others regarding a practical incandescent light system. We now publish challenges from W. E. Sawyer to Mr. Edison, published in the New York, "Sun," December 22d, 1879, and January 6th, 1880, which will prove of interest in view of subsequent events.

XXX. Edison is going over the same ground that Daulligree, Loeb, Grene, Koffel, Keen, Starr, King, myself and others have traversed—first, iron, second, platinum, third, carbonized, different shapes. And Edison has failed, in my opinion. To show that I mean what I say, I deny every one of his allegations made at the Sanctions Convention of the American Society for the Advancement of Science, and, specifically, I challenge him:

First. To maintain a vacuum in his lamp.

SIXTEEN. To run his carbonized paper lamp three hours. (In practice, in a perfect vacuum, it will last twenty minutes.)

SEVENTEEN. To consolidate platinum by heating electrically in the Sprengel vacuum, as he claims.

EIGHTEEN. To prove that his dynamo-electric machine develops not slowly, but even forty-five per cent. of the foot pounds applied to it.

NINETEEN. To show that he can obtain a light of twenty-five candles from platinum with less than three horse power.

TWENTY. To show that platinum or iridium will not disintegrate in twenty hours' actual running.

SEVENTY. To prove that with his carbonized paper lamp he can obtain two lights of ten candles each per horse power.

EIGHTY. To show that the effect of the oxide of magnesium is to harden his wire, and make it more refractory.

And I further allege that all Mr. Edison's statements are erroneous, and I offer \$100 as a prize for him to prove each of the above eight allegations. Let him run one of his lamps three hours, and the public will be satisfied that I am correct.

W. E. SAWYER.

78 Walker Street, New York, December 21st.

To the Editor of the "Sun":

SIR—Notwithstanding the assertion that one of Mr. Edison's electric lamps has been running for 240 hours, I still assert, and am prepared to back up my assertion, that Mr. Edison cannot run one of his lamps up to the light of a single gas jet (to be more definite, let us call it twelve candle power) for more than three hours. To be still more definite, I offer to Mr. Edison, at 228 West Fifty-fourth street, in this city, an opportunity to prove what he says. From the private residence in that street where are run a circuit of 1,000 feet. Mr. Edison shall have every facility; he shall use my wires; he shall have any dynamo machine or other generator of electricity he may prefer; and all I ask is that the power of his light shall be measured by a photo-metre; that once in place it shall not be interfered with; and that a committee of gentlemen, preferably nominated by the editors of the New York press, shall be present and certify to the facts of the test.

Furthermore, I will place one of my lamps side by side with Mr. Edison's; it shall be run at the power of twenty-five candles; it shall outlast the entire forty lamps at Menlo Park, run at the power of twenty-five

candles; my lamp to stand as it is put up, and Mr. Edison to put up a fresh lamp as fast as the preceding lamp shall have burned out.

I am anxious for this test, and if Mr. Edison has really run one of his incandescent lamps 240 hours he will not refuse to accept my offer, for he will be treated with the utmost courtesy, and shall have everything his own way.

I adhere in every particular to my original challenge to Mr. Edison.  
W. E. SAWYER.

78 Walker Street, New York, January 4.  
Monday, January 6, 1885.

Sawyer's lamp, referred to above, and on which a patent was applied for in 1879, and granted in 1885, is and will always remain a curiosity. The lamp is not even practical enough to retain the gases, it was intended to fill it with. The Edison Company never used commercially anything else but a vacuo-fluement lamp. The legatees of Mr. Sawyer have found nothing in the assets (his nitrogen lamp) of utility, consequently they imitated the Edison lamp, notwithstanding Mr. Sawyer's professions on vacuo-fluement lamps. The Sawyer-Man Company now attempt to induce the public to believe that they had produced the incandescent lamp, when in reality its commercial form in the first instance had been condemned by them.

#### MISSTATEMENT CORRECTED.

The following letter explains itself:

CHICAGO, Oct. 26, 1885.

THE ELECTRICAL REVIEW, 93 Park Row, New York City:

GENTLEMEN—In your issue of the 17th you state that the Mather Electric Light Company are lighting one of the theatres here. They attempted to light part of the auditorium of one of the theatres here; and Mr. John Haggood, who represents the Mather Company here, told me in

conversation a few days ago that the Mather Electric Light Company had no system.

The Western Edison Light Company has sold plants to McVicker's Theatre and the Chicago Opera House this year, and to the Columbia Theatre (formerly the Haverly) three years ago. We sold a plant to the Academy of Music, which lights only a part of the theatre, they having power only sufficient to run the number of lights they are using.

Your article will give the public the impression that the theatres lighted by the Edison light are using the Mather light, when in fact this Mather light was taken out of the Grand Opera House early last spring, and has never been replaced.

We know of no theatres in Chicago lighted by the Mather light or any incandescent system except the Edison; and the Mather Electric Light Company have not a plant in operation in the city to our knowledge.

Very truly yours,

WESTERN EDISON LIGHT CO.,

(Signed) P. S. GORTON,

Treasurer.

(Note).—Since the above was written we have been informed that the Mather plant was taken out of the Grand Opera House the 29th of August, and not "early last spring."

#### THE MOST PERFECT SYSTEM OF ELECTRIC LIGHTING IS THE EDISON INCANDESCENT LIGHT.

It presents the following Unequalled Advantages.

- It is the most economical artificial light.
- It is brighter than gas.
- It is steady as sunlight—never flickers.
- It is reliable.
- It emits no heat.
- It cannot vitiate the air.
- It gives no disagreeable odor.
- It is beneficial to the eyesight—not injurious, as gas.
- It is the most beautiful light known.
- It is perfectly safe.

It cannot produce fire in the most inflammable substance.

It cannot explode.

It cannot produce death by poison, as gas often does.

It cannot cause a harmful shock to the human system, as the arc lights do.

It gives colors their natural tints.

It can be placed in any desired position, thus utilizing all the rays of light.

It secures (by the use of small sixteen-candle power lamps) uniform and economical distribution of the light—impossible with arc lights of larger power.

It can be used anywhere, under any conditions.

It cannot flare or be blown out by the wind.

It dispenses entirely with matches or special lighting apparatus.

It is perfectly under control. Each lamp is independent of the others, yet all or any desired number can be lighted or extinguished instantaneously, so that

It is a perfect burglar-alarm.

It does not consume the Oxygen, and thereby exhaust the atmosphere of an apartment.

It produces no poisonous product of combustion, such as carbonic acid, or carbonic oxide, which are both largely produced by gas and oil lights.

It produces no water of combustion. A gas or oil light produces a large quantity of water in an evening, sufficient, if condensed, to partly fill a tumbler.

The electric conductors contain no poisonous, bad-smelling substance to escape in the house, through defective joints, and to cost the consumer an outlay for medical attendance, and a steady running expenditure, more or less, for leakage.

It does not emit smoke to blacken the ceilings or walls, or destroy pictures by covering them with a layer of oily soot, which cannot be cleaned off.

It does not leak sulphureted hydrogen to blacken silverware, or lead-painted woodwork, or destroy oil-paintings.

It cannot, like gas, be improperly extinguished, and pour a dangerous vapor into the apartment for hours, which may destroy the sleeping consumer by poison, or a violent explosion.

It is the only system complete in all its details, and which can guarantee throughout the validity of its patents.

#### ECONOMY OF THE EDISON INCANDESCENT LIGHT.

Extract from the Warlan's report of the "additional penitentiary" at Anamosa, Iowa, dated June 30, 1885:

"We have doubled the number of Edison lights in the cell house, placing one in front of each cell; and now have an ample supply of light in each and every department now erected, as well as a reserve of power for lighting other departments, whenever such may be built. During the month of June, 1885, while using steam for lighting purposes only, I thought it would be well to make another test of the expense of lighting our institution, which resulted as follows: We ran during the thirty days of June 345 lamps for 703.33 hours, consuming in that period of time 34,880 pounds of coal, in the following manner: For fifteen days we used Oslyn (H.C.) coal, running the lamps for 351.66 hours, and consuming in that time 14,733 pounds of coal, making an average consumption of 40.53 pounds per lamp, at a cost of \$2.821 per ton, and making the daily cost \$1.3292. The hourly consumption was 482.45 pounds, giving at \$5.621 per ton, an expense of \$0.01146 per hour. For the remaining fifteen days we used 'Wax Chert' (Craw) coal, running 351.66 hours, and using 10,633 pounds of coal, which gives an average of 129.86 pounds per lamp, and at the rate of \$2.35 per ton, makes the daily expense \$1.5164. The hourly consumption of this coal was 651.85 pounds, which, at \$2.35 per ton, makes the cost per hour \$0.5002.

#### RECAPITULATION.

Number of Lamps in use during June, 1885.....	345
Fifteen days at \$1.3292.....	\$20.439
Fifteen days at \$1.5164.....	23.421
	\$44.320

Average cost per lamp, \$1.471; 345 lamps used 703.33 hours and costing \$44.320, gives \$4.0252 as the cost per hour for the whole number and as the cost per hour for one lamp.....	\$0.001623
Cost of lamp, \$0.85; life of lamp, 600 hours; cost of lamp per hour.....	0.001416
Cost of lubricating oil for engine and machinery and for all other expenses.....	0.00044

Total cost per lamp per hour..... \$0.003483

"I will here state that the life of our lamps, which is guaranteed to be 600 hours, far exceeds that number, and in one instance a lamp burned for 1,255 hours, while a large number have burned for more than 2,000 hours. During last month they averaged over 1,500 hours apiece, thus effecting a reduction of 50 per cent. on original price of lamp.

"The recapitulation of these figures shows that after operating 345 16 C. P. lamps for 703.33 hours, the net cost of producing the light of one lamp one hour was .003382, or a total amount, including interest on investment and depreciation on plant, of \$46.81 for furnishing 345 16 C. P. lamps for 703.33 hours.

"Assuming each 16 C. P. lamp to equal in illuminating power a gas jet consuming 5 feet of gas per hour, we have 1,218,344.55 cubic feet, showing that the gas would have to be produced for 70 cents per thousand feet.

"It must be borne in mind that this is for only 345—16 C. P. lamps, and that the ratio cost of production decreases as the quantity of lamps increases."

#### FLINT MILLS PLANT, FALL RIVER, MASS.

FALL RIVER, MASS., Nov. 17th, 1885.

E. H. JOHNSON, Esq., Pres't.

DEAR SIR—I encountered a little time to-day, by accident, which will be of interest to you, and would be well for all the agents of the Isolated Co. to have for reference.

The Flint Mills of Fall River is one of the newest and best equipped establishments in the city. It runs 40,004 appliances, with "preparation," and weaving to dispose of their output—these being "ring spindles," the equivalent of about 10,000 spindles in "wales."

In the annual statement to the stockholders, at their meeting October 30, 1885, the Treasurer reports as one of the expenses of the business year,

"Light"..... \$600 48."



This mill is lighted by 750 sixteen C. F. Edison lamps, in an isolated plant. To light a mill of this size, as well as the Flint Mill is lighted, would probably cost \$1,500, in Fall River, by gas.

In fact, the Chace Mill, whose year ended at same time as that of the Flint Mill, and whose equipment consists of 60,000 spindles, reported their gas to have cost them, for the year, \$1,608.84.

It being evident to any passer-by, after lighting begins, that the Chace Mill is not half as well lighted as the Flint Mill, and the Treasurer of the Chace Mill being also the Treasurer of the Manufacturers' Gas Co.—we intended to make a good showing for gas—these things being considered, and the electric light of the Flint Mill costing but a trifle over 60 per cent., the cost of gas at the Chace Mill is one of the triumphs of the Edison system, which should insure to the benefit of the Edison Co.

Yours very truly,

SPENCER BORDEN.

## SECOND AVENUE CAR STABLES, N. Y. CITY.

OFFICE OF THE  
SECOND AVENUE RAILROAD CO.,

Second Ave., cor. 90th St.,

JOHN B. UNDERHILL,  
Sole & Trans.

New York, Oct. 26th, 1885.

J. HITCHCOCK, Esq., Manager Edison Co. for Isolated Lighting:

DEAR SIR—One night last week we used the gas throughout our building and I kept account of the meters, which showed the next morning that we had burned 1,200 ft. of gas, at a cost of \$1.75 per M. ft., would be \$18.75 for the night. We have about 100 gas jets. Now we have 250 of your lights in use every night. If we had as many gas jets as your lights the cost of gas that night would have been just twice as much, or \$37.50, or \$300.00 per month of 30 days. To run the 250 electric lamps it cost \$4.00 per night, or \$120 per month, showing a saving of \$6.47 per night vs. 100 gas jets, with more than twice as much light.

Yours truly,

JOHN B. UNDERHILL,  
Trans.

NOTE. The above company run their plant 365 days per year, obtaining twice as much light as they formerly obtained from gas, effecting a saving of \$18.84 per night, or \$4,511.10 per annum. The 250 lights referred to include the lighting of the new building, from which gas has been omitted.

## TESTIMONIALS.

The following interesting letter comes unsolicited from Mr. D. McInnes, the Managing Director of the well-known Canada Cotton Manufacturing Company of Cornwall, Ontario, which we lighted about three years ago by the Edison System:

CORNWALL, Oct. 29th, 1885.

THE EDISON ELECTRIC LIGHT COMPANY:

GENTLEMEN—We have the pleasure to inform you that your incandescent Electric Light with which our Mills are lighted is giving the most entire satisfaction.

It was first introduced into our weaving mill, which is 600 feet long by 100 feet wide, in the autumn of 1883, and afterwards into our spinning mill of about 40,000 spindles.

We consider the incandescent electric light the best yet invented for industrial concerns like ours; it is a safe light; it is free from smell, smoke and heat; these are great advantages in a cotton mill. Our Mills were formerly lighted with gas, and taking the cost of the plant for gas and for the electric light at the same prices, the cost for lighting mills with the electric light we make out to be about half the cost of the gas. And for our part we would prefer to pay for your light than have the gas supplied free of cost.

We remain, dear sirs,

Yours very faithfully,

THE CANADA COTTON MANUFACTURING COMPANY,  
Per D. McINNES.

### ANOTHER HOTEL PLANT.

Mr. F. S. Gorton, of the Western Edison Company, while travelling through Colorado on a pleasure trip, recently sold a plant to the New Iron Springs Hotel at the well-known resort of Manitou Springs. The manager of the hotel, Mr. W. E. Smiley, in writing to Mr. Gorton under date of Oct. 7th, says, "I have received letters from all over the West, asking what we thought of your system and all got the same answer—the most perfect light in the world; all our guests are delighted with it."

The following letter will prove interesting to agents:

#### THE EDISON ELECTRIC LIGHT.

Powers Hotel Lighted by the Incandescent System.

The Rochester "Daily Union and Advertiser," October 30th, 1885, says:

Mrs. Buck & Sanger, proprietors of the Powers Hotel in this city, have just added the advantage of the Edison system of electric lighting to the other first-class appointments of the establishment. Some two hundred lights have been put up in the rotunda, dining-rooms, drawing-rooms, reception-room, reading-room, billiard-room and halls. The illumination is as nearly perfect as possible, showing that there are no means by which a hotel can be as well lighted as by the Edison system. The brilliancy and steadiness of the light add greatly to the other decorations of the hotel, while in the dining-room the perfect diffusion of the light is admirable and attractive.

### EDISON LIGHT BEAMS.

[From West Chester Local News, Oct. 24, 1885.]

The light furnished last night by the Edison Illuminating Company was first-class all over town. The stores, offices and dwellings thus lighted up were flooded with the rays of the electric spark, and the street lamps imparted to our thoroughfares a cheery appearance.

On South Church and Dean streets the blackness of the dark night was unbroken, and pedestrians were not pained with the situation. If the electric light people will turn on their light in these dark quarters they will be doing much towards making happy many people. Don't fail to do so to-night under penalty of some very severe remarks.

"No need of throwing the light on the town clock's face. It is perfect now, only I think the light on the inside might be placed a little nearer the dial. Ours is the first. Even Independence Hall is not lighted by electricity yet."—F. P. D.

"I was out late and did not get in until 2 o'clock this morning. Had new dentures put in. But what I want to say is this: I have been living in West Chester 28 years, and I am willing to make affidavit that I never saw the streets of West Chester so nicely lighted before. It was very dark and the electric light shone beautifully, throwing its rays a great distance. Many a time in damp, dewy or foggy weather the street gas threw out a light of a few yards in the immediate vicinity of the lamp, but for almost a half square last night one could almost read a paper. I was almost beside myself with joy, for I was getting tired about the success of the electric light for street purposes."—M. A. S.

"While wandering my way to market this morning before daylight I could not but admire the bright light of the electric lamps on the streets, and when I made my way into the market house I thought I was entering a dark cavern."—A. High street lady.

THE ELECTRIC LIGHT IN COLUMBIA.—The new electric light was tried in several of our stores on Tuesday evening, and it worked to a charm. The light is soft, steady and uniform, without the usual flickering, and has now approached to daylight. Wednesday and Thursday the lamps were put up, and the whole town is now lighted by the electric current, and presents a bright and cheerful appearance, and our people are delighted.

—Continued.

The electric light last night was charming all over town. The streets, wherever the lamps were in operation, were never lighted better—or so well. The public voice was justly loud in its commendation, and the public pulse beat in happy unison with the measured strokes of the busy engines at the station. Thanks to the men at the helm.

There was a funny scene yesterday afternoon, in which the President and Vice-President of the Edison Electric Light Company were the leading and only actors. They had forgotten to pay their gas bills until the last moment of the day of grace had expired, and with their bills in hand stood knocking for admittance at the Gas Company's office. Their raps, however, did no good, and they turned from the scene with the 18

per cent. addition stamped upon their countenances. Sorry we saw them but we couldn't help it.

"I was at the First Baptist Church Sunday evening. It was lighted by electricity and looked charming."—One who is not a member.

"Sure! It can be done. Last night everything was scholastic. The light alone fresh and there was much joy. I guess it will come about all right in due time. "You try it first, last and all the time."—A zealous advocate of "the light of the age."

"I have a good story to tell you. Sunday evening at 7.30 o'clock one of the committee of the Borough Council, who has the lighting of the Court House steeples in charge, went up into the tower and turned off the electric light and put on the gas. He was to allow the latter to burn ten seconds the difference in the two lights, as they were two or three miles gas he came down from the tower and out upon the street. Thinking that the electric light had gone down, a well-known gas man said, as he washed the face of the clock (addressing an electric light advocate who knew of the plan):

"If you had gas up there instead of electric light you would see the difference very soon. That's miserable."

"Why, my dear sir, the electric was just a moment ago shut off, and it is the gas that you see up there now!"

"Who's been tampering with our burners?" the gas man asked, very much disconcerted.

"Why, one who has a perfect right to do so. He is a member of the Steeple Lighting Committee."

And now these two never murmur as they pass by. Don't say anything about it in the Local News.—D. F.

EDWARD H. JOHNSON,  
President.

#### ERRATUM.

Bulletin No. 10, page 20, thirteenth line should read: "Merriman Mill," Lowell, Mass., now has also 220 Edison lights."

No. 12.

## BULLETIN FOR AGENTS.

THE EDISON COMPANY FOR ISOLATED LIGHTING,  
65 FIFTH AVENUE.

NEW YORK, JANUARY 18, 1885. [Ed.]

#### CONTRACTS CLOSED.

Since November 4th, 1885, we have closed contracts for the installation of 33 plants, aggregating 7,500 lamps. The Western Edison Light Co. have installed 14 isolated plants of 3,655 lamps capacity, making a total of 10,955 lamps. The contracts closed are as follows:

SOLD BY	PURCHASER.	Dynamo Cap.
Benton & Houghton	American Express Co., N. Y. City (increase).....	800
" "	L. Steinhilber & Son, city (increase).....	25
" "	Chas. A. Scheraga & Co, city.....	00
" "	Francis Hacco, Waterloo Wagon Works.....	200
" "	Waterloo, N. Y.....	
" "	Williamburgh City Fire Ins. Co., N. Y. City, Replaced United States plant.....	100
" "	Geo. Jetter & Son, Port Chester, N. Y.....	50
" "	The N. Y. Produce Exchange Safe Deposit and Storage Co. Replaced Stanley light.....	200
" "	The "Saturday Globe," Utica, N. Y.....	25
" "	Globe Wagon Mill, Utica, N. Y.....	200
" "	Swifts Cattle, Oswego, N. Y.....	300
" "	Mills Building, N. Y. City (increase).....	300
" "	Phoenix Horse Shoe Co., Poughkeepsie, N. Y. (increase).....	85
" "	Kellogg Terrace.....	150
	Carried forward.....	2,008

SOLD BY	PURCHASER.	Dynamo Cap.
Benton & Hughes	Brought forward	5,008
"	Mr. St. Vincent Beauregard and Co., N. Y.	
"	City	100
"	Edison Electric Co., Watertown	
"	N. Y.	100
Card, B. F.	Dakota Falls, N. Y. City (increase)	400
"	Walling & Campbell, N. Y. City	60
"	Lord & Givens, Troy, Ind.	75
"	Alken, Son & Co., N. Y. City (increase)	100
Canadian Dept.	Repurchased United States plant	250
Clark & Davis	Canada Cotton Co., Cornwall, Ont. (increase)	100
Crosby, T. F.	A. Gilson, Macarville, N. S. (increase)	75
"	A. H. Dole & Co., Galveston, Texas	100
Hill, W. P.	Galveston, Texas	100
"	Globe Democrat, St. Louis, Mo.	400
Markle, John H.	St. Louis Exposition, St. Louis, Mo.	1,000
"	H. Holmes, Terre Haute, Ind.	20
"	Kalamazoo El. Co., Kalamazoo, Mich.	250
"	Notre Dame University, South Bend, Ind.	100
*N. Y. Office.	Graham Mangle Co., New Bedford, Mass.	250
"	(increase)	
Paine & Francis	Boston Sugar Ref., Boston, Mass.	250
"	Mass. Hospital Life Ins. Co., Boston, Mass.	100
Palmer, U. H.	Massachusetts Insurance Co., Washington, D. C.	250
Shelden, W. A.	North Dakota Hospital for the Insane	100
	Total	7,860

**PLANTS INSTALLED BY THE WESTERN EDISON  
LIGHT CO. FROM NOVEMBER 4, 1885.**

	No. Lamps.
Chicago Opera House, Chicago, Ill. (increase)	60
Dering & Co., Wm., Chicago, Ill. (replaced Van Deputte Incan- descent plant)	400
Edwards, H. D. & W. N., Chicago, Ill.	100
Farwell, John V. & Co., Chicago, Ill.	250
Hefenmann Bros., Waukegan, Wis.	60
Mandel Bros., Chicago, Ill. (increase)	300
Marshall & Son, O., Milwaukee, Wis.	60
Mentank Block, Chicago, Ill.	75
Northwestern Mutual Life Ins. Co., Milwaukee, Wis.	800
Printer & Vogel Leather Co., Milwaukee, Wis.	100
Reynolds & Co., C. T., Chicago, Ill.	100
Taylor Bros. & Co., Chicago, Ill.	100
Union Elevator Co., East St. Louis, Ill.	100
U. S. Rolling Stock Co.	800
	5,025

[London "Engineering," Nov., 1885.]

**INCANDESCENCE ELECTRIC LAMPS FOR CITY  
LIGHTING.**

The Edison electric system is used on a large scale for street illumination in six American cities, and on a limited number of street lamps in many other places. A local Edison Company has recently been awarded the contract for street lighting in the City of Lawrence, Massachusetts, U. S. (population 40,000), under circumstances of interest both in regard to the price, at which gas competition was met, and the electrical arrangements adopted for lighting 80 miles of streets.

The Edison Company are to light 473 incandescence lamps of 10 candle-power, except those on the common and principal business streets, where they are to be of 16 candle-power; and 100 lamps to "burn" all night, for 650 dols. per month for a five years' contract, and extra lamps *pro rata*. The Edison Company to have free use of all street lamp-posts now owned by the city, and to take entire charge of the lighting plant, making all repairs for the sum mentioned. At the termination of the contract, they are to retain ownership of all poles, wires and fixtures furnished by them.

The cost for lighting the city for 1884 with 280 gas street lights & 4 t. burners, giving about eight candle-power, and 168 coal oil lamps with a brilliancy of six candle-power, was 760 dols. per month, for all charges, with gas at 1.80 dols. per thousand cubic feet. In the face of this competition the gas company offered to renew their present contract for 500 dols. per month, but the offer was not accepted even at the reduced price, because the electric illumination was considered more desirable and on the basis of the total amount of light furnished evidently cheaper, as the aggregate candle-power contained in the proposition of the gas company amounted to 3200 at a price of 500 dols., while the electric

company contracted to furnish illumination by incandescence which amounts to 5000 candle-power for 650 dols., a reduction of 18 per cent.

In time of fire occurring at night after any portion of the lights are switched out, the electric company are to turn the light on the districts indicated by the first city fire alarm.

In its electrical arrangements the plant will contain numerous modifications which adapt the Edison system to the work of sustaining incandescence lights distributed over a large territory by aerial wires.

At each lamp an electro-magnet in shunt will switch out the lamp in case of its failure, and thus prevent the lights on that series from going out in case of any mishap to any lamp.

The arrangement of this plant is in many respects radically different from the method of using three underground leads to supply lamps in multiple arc as is usually carried out in the Edison system.

The central station of this company at Lawrence has for several years been engaged in the distribution of electricity for incandescence lamps in stores, dwellings and some of the cotton mills, and also to electro-motors, one of which is used to operate the presses employed in the publication of a daily paper, and another drives the elevator in a storeroom belonging to one of the cotton mills.

#### SOME FIGURES ON STREET LIGHTING.

[From the *Cleveland "Leader and Herald,"* Dec. 25, 1885.]

##### The Lighting Problem.

The Council and Board of Improvements are again trying to solve that old problem which presents itself once a year as regularly as January follows December. The question, plainly put, is, how can the city contract

to pay for \$115,000 worth of street lighting when there is only \$100,000 in the fund provided for that purpose? The city officials who tried to answer this question one year ago gave it up in disgust. In consequence contracts were made which involved the payment of only so much money as was in the fund, and the lighting for the remainder of the year was provided for by borrowing from other funds during the summer. The lighting fund for 1886, derived from a levy of 1 1/4 mills on a duplicate valuation of \$88,000,000, amounts to \$101,500. The lowest estimate for the lighting during next year is \$60,305.30, which provides for 4,000 gas lamps and the care of the same, 1,470 vapor lights, 32 electric lights on masts and 17 electric lights on poles, these to burn 2,500 hours per year. The estimated cost of repairs, \$2,000, added to this, would make the total \$101,305.30, or \$105.30 in excess of the fund. Under the law the Auditor has no right to certify that there is money to the credit of a fund to meet a contract obligation, unless a sufficient amount shall have been placed in the fund to meet such obligation. The highest bid providing for the burning of all the lights above mentioned 2,700 hours is only \$17,116.60, including repairs, and if contracts are to be made for less than a year this bid might just as well be accepted as the lower one. Cleveland has outgrown her country village airs, and it is time that her streets were well lighted, not only a part of the night, but all night. In other cities of the same size the street lights are burned all night, or 8,700 hours per year, and this plan was adopted here one year ago.

#### THE UNITED STATES LIGHT IN THE WEST.

The following newspaper items will serve to show how the United States electric light is regarded in Chicago. The United States Electric Lighting Company had great success on having secured the lighting of the County Buildings in Chicago, their claims being that this is the largest lighting by incandescence in the country, while the fact is that years ago the Edison Company had several installations of over 5,000 lights. The lighting of the largest of these buildings by the United States Co., viz., the Cook County Court House, with 1,300 lamps, is eclipsed by an Edison installation of 1,700 lamps in the Chicago Municipal Building and two tunnels under the Chicago River.

["The Times," Chicago, December 13, 1886.]

### The County Buildings.

A Taxpayer Suggests that the County's Electric Light Fixtures be Thoroughly Inspected Before Acceptance.

A person signing "Taxpayer" puts the following questions regarding the county's electric lighting plants, recently started up by the United States Electric Lighting Company: "What apparatus, if any, have the United States Electric Lighting Company on their county plants to tell whether they get a certain number of lamps per horse-power or what ratio the lamps are burning? Why don't they conceal the wires and not spool the fixtures by having them wound with wire? There is no such tetch in the City Hall. The county electric light plants ought to be thoroughly inspected before acceptance."

[Chicago "Tribune," Jan. 3, 1886.]

### Lighting the County Buildings.

Some Criticisms Made on the Arrangements of the Wires and Fixtures.

"The Daily News" of Dec. 30, said in regard to the lighting plants recently installed in the County Buildings: "Commissioner Klehm, accompanied by a representative of the United States Electric Lighting Company, went through the County Building yesterday to inspect the plant recently put in by that company. Mr. Klehm pointed out places where there ought to be fifty or sixty additional lights. The job of putting in the lights was a bad one, as a whole. Braided iron tubes or arms were put in where brass should have been used. A number of the lights had burned out, although they had been lighted but a few times for the purpose of testing them. In many instances the wires are strung along the outside of the tubes of the chandeliers, instead of being inside them."

"The Tribune" of the same date, in commenting on the work in this County Building, remarks:

"About noon the dynamo engine was put in motion, and a few minutes afterward the various departments in the County Building were lighted up. President Klehm and the managers of the Electric Lighting Company made a tour of the building to observe 'how the lights worked.' The company has failed to give the proper appliances, in many instances, according to the terms of the contract. For instance, many of the stems projecting from the old gas chandeliers are made of iron, when they should have been brass. Mr. Klehm will not recommend the acceptance of the contract

until the company has prepared everything in the way of appliances in accordance with his wishes."

In comparison to the work in the City Hall, where the Western Edison Company has completed such a magnificent system of lighting, it is no wonder that the County Commissioners regard the work in the County Building, performed as it has been, with distrust.

The Western Edison Company is composed of some of our most influential citizens, and has a reputation well-earned of carrying out its contracts in every respect, no matter at what trouble or expense. The many plants installed in Chicago by this company are abundant proof of this assertion.

[Chicago "Tribune," January 30, 1886.]

### The County Buildings.

Something Regarding their Lighting System—A Card from Mr. Warren.

CHICAGO, Jan. 2.—TO THE EDITOR:—My attention has been called to the publication of several letters in the daily press of the city, signed "A Citizen," "A Taxpayer," etc., regarding the lighting of the County Buildings by the United States Electric Lighting Company.

As these letters have evidently been written by one of our disappointed competitors, and as they seem exceedingly nervous over the successful completion of the largest plant ever installed in the country, I have thought it wise to give the information asked regarding wiring, etc., in order to save the *d. c.* a severe fit of sickness. Great stress has been made in the comparison of wiring and fixtures as between the City Hall and the County Buildings. The chandeliers in the City Hall were originally constructed with a view to their utilization as shot-tollers; or what are termed combination fixtures, while the gas fixtures throughout the County Building were of the old style. The city's electrician, with a foresight this does him credit, arranged all the little details in the City Hall so important to the workmen, and through the same valuable aid and experience our friends on Dearborn street were enabled to light up the one or two stories of the City Hall that "refused to go" for several weeks after the rest of the buildings was lighted. Of course, tastes differ as to the color of the light; while perhaps some people would prefer the yellow of the City Hall lights, many others would decide in favor of the pure white of the County Buildings. Concerning any difference of opinion between the company I have the honor to represent and the county, the *d. c.* before mentioned is referred to President Klehm, who has gone over the entire matter and is

fully posted. His address is the County Commissioners' room at the Court House. In a company of the magnitude of the United States Electric Lighting Company, whose business the past year has been unprecedentedly large, the hundreds of men engaged in wiring, etc., are as carefully looked after as is possible in any systematized business. That a foot or two of wire is valuable in so large a building as the Court House was perhaps unavoidable. President Eaton, we think, is satisfied that the county's interests will be fully protected in the matter of carrying out our contract in every particular. I have no doubt that the mortification felt over the fact that only six lamps per horse-power can be given instead of ten, as our people guarantee, implies much of this journeying feeling.

If any one knows of a successful system of electrical lighting that depends entirely upon the "eluciscent receptibility" of its board of directors, a chrono is ready for him.

Respectfully,

C. C. WARREN.

On March 25th, 1885, Mr. Chas. Counselman, member of Committee to purchase Electric Lighting Apparatus for the Board of Trade Building in Chicago, addressed the following letter to the above C. C. Warren, which we reprint from Bulletin No. 2, and refer to the same number for additional correspondence between the above parties.

"C. C. WARREN:—I saw your light—after that I got the Edison Light, and then, after comparing lights, I concluded I would not have yours.

Action of our Committee was unanimous. I see you have no apology. Certainly do not expect an apology from a man capable of humiliateing the good name of a competitor who competed fairly and has not in any one instance spoke disparagingly of your company. I am a special advocate always of fair play. Jealousy is always the distinguishing mark of an attenuated brain; it also suggests cowardly attack when its hopes cannot be realized.

Yours, very truly,

CHAS. COUNSELMAN."

(Signed),

"The Mail and Express," N. Y. City, in its issue of November 4th, 1884, published the following:

**The U. S. Electric Light Company.**

Eighteen months ago a corporation was ushered into existence under the title of the United States Electric Light Company. Its sponsors were

William H. Grace and his business partner, Charles H. Flint. The per value of stock in the concern was fixed at \$100 per share. Several wealthy men invested in the enterprise, believing that there were "millions in it," that Grace would procure fat contracts for lighting New York and other cities, and that, in short, no such concern had been struck since the discovery of the salted diamond fields in the Eden beyond the Missouri.

"It was a man game," said one of the investors who was met yesterday by the writer. "Grace says Flint struck the idea, while Flint maintains that his partner deserves all the credit. A good many of us dupes who have got more money than brains were taken into camp. Don't print my name, because I don't want to be laughed at. I should think the generals who worked the racket must have realized about \$700,000. A small little sum for a rummy day!"

"Who were the big victims?"

"I believe the amount sunk by Jos. Newton was \$118,000. A wealthy Madison Lane Jeweler took a flyer for \$107,000. I know of three bank presidents who each took stock amounting to \$25,000. Grace wanted to give all his rich friends a chance. He did the thing in a princely way, showing greater gentles than Ferdinand Ward, who was silly enough to get caught."

"Was there any special feature about the business that pointed to the investment as a good one?"

"It looked very promising. Inside of a year and a half three dividends of five per cent. each were declared on the stock. Then the knowing ones unloaded at high figures, the dividends were stopped, and the stock is now worth about seventy-five cents on the dollar."

"What are the assets?"

"We own a fine corporate name, The United States Electric Lighting Company. That don't sound bad. I believe also they have a desk, a couple of books, and they say they have a factory out in Newark. There is some talk about contracts which they are said to hold."

**THE AMOUNT OF POWER USED FOR ELECTRIC LIGHTING.**

"The Electrician and Electrical Engineer," N. Y. City, continued the following in its August number with reference to the above subject:

Referring to a leading article on "Electrical Units" in a contemporary,

in which it is stated that at the present moment there is not in the whole world 10,000 indicated h. p. used in the production of electricity, Mr. M. A. Miller, C. E., of Newark, N. J., writes: "I should like to state that in the United States alone there is a greater amount of steam power used for electric lighting than four times the number of indicated h. p. stated. I can prove that but one of the leading electric light companies of the States, viz., the United States Electric Lighting Co., which uses the Weston systems, has as and incandescent lights and dynamo machines running which use

For the City of New York, three stations.....	2,000 H. P.
Independent plants, including Brooklyn bridge.....	1,000 "
In different parts of the country, (Arc lights).....	5,000 "
Independent plants.....	5,000 "

Local stations at Boston, Manchester, Providence, Newport, Rochester, Newark, Philadelphia, Baltimore, Washington, Charleston, Toledo, Ohio, and many other places.....

Making a total for one electric lighting company alone of..... 23,000 H. P.

That this statement is rather below than above the actual number of h. p. used for the Weston systems may simply be proved by the fact that there have been built up to the present time more than two thousand Weston dynamo machines, requiring in the average each about 10 h. p. The United States Electric Lighting Co. has formerly also built about 500 Weston machines, averaging about 6 h. p. each, giving thus a total number of h. p. as stated above. Taking the Edison, the Brush, the Thomson-Houston, and half a dozen other electric light companies into consideration, I think 40,000 h. p. used for electric lighting purposes in the United States alone, would rather be a low estimate than otherwise."

The Edison Company, with over 300,000 lamps in actual use in the United States, employ over 37,000 h. p. for incandescent lighting alone.

[Chicago Tribune, Jan'y. 3, '86.]

#### THE EDISON LIGHT.

Its Business Largely Increased.

The reason for this is they have the only perfect system, including everything to prevent fire, and make the light so very convenient that

those who have once used it would not go back to gas under any circumstances. The public are aware that the Edison Incandescents do not do what the Edison people do, and the Edison Company are replacing these so-called systems, having done so in several important cases lately. Ask any one using the Edison what he thinks of it. The lamps in many cases last one year without renewing. The Western Edison Company is composed of some of our best and most respectable citizens. When they take a contract they do the work perfectly, as shown in the City Hall and the tunnels under the river.

[Chicago Evening Journal Dec. 31st, 1885.]

#### THE EDISON.

##### The Triumphant Electric Light.

The Edison Electric Light Company has made remarkable progress during the past year. Our merchants begin to realize the absolute perfection of this light. It is steady; it is brilliant and beautiful, and what is still more important, it has proved a great saving to our merchants. It is attractive in stores, and draws customers like a magnet. Our city authorities also appreciate its worth, and it is already proving a great boon in the City Hall and in the tunnels, and besides saving the taxpayers a very large amount of money. The Edison Electric Light is regarded by experts as the most perfect in use, and predict that before many years the entire city will be lighted with this clean, steady and very beautiful light. The office of the company is in the Adams Express Building, on Dearborn street.

[Chicago "Inter-Ocean," January 3, 1886.]

#### THE EDISON ELECTRIC LIGHT.

The Steadiest, Safest, Cheapest and Best Illuminator in the World.

Lights Operated from Central Stations Cheaper than Coal or Water Gas.

THE LIGHT OF THE FUTURE.

Of all the systems of electric lighting now before the world none present such admirable and essential features as that known as the Edison



Incandescent. It is steady, emits no noxious gases or perceptible degree of heat, is beautiful, brilliant, neat, cheap and convenient. Everybody has seen in the stores, offices and other places of business small, pear-shaped glass globes, made of which is a loop which resembles a fine wire, and which at night is heated to an intense white heat, and burns with undiminished brilliancy, and is not consumed. These are Edison incandescent electric lamps. They are constantly growing in popular favor, and popping up secretly in unlooked-for places. They are incomparably superior to any form of illumination in use. It is not necessary to describe this system particularly, as reading people are familiar with its general features, construction and operation, and understand that it was devised and perfected by the most noted electrician and inventor in the world, Mr. Thomas A. Edison. The light is so steady that it will not injure the eyes; it consumes no oxygen, and does not vitiate the atmosphere around it; it emits no odor, and is in all respects agreeable and healthful. It produces so little heat that it will not ignite the most inflammable material that comes in contact with it; it is operated by an electric current so slight that it is scarcely perceptible to the touch, and its adoption would remove all risk of asphyxiation from escape of gas, or burning from the explosion of inflammable oils, or death from electric shock from such heavily charged wires as are necessary for most of the lights of other companies in use; and it can be used in mills and factories where any other light is inadmissible. In view of these facts it is not surprising that the year just closed has been a prosperous one for the Edison Companies.

They have placed their lights in cities, towns and villages, in all parts of this country, and have demonstrated the feasibility of their underground central-station system by many successful plants, some of which include a great number of lamps. Among the important cities supplied with light by the Edison Company from central stations and underground wires are New York, Fall River, Mass., London, Eng., Berlin, Germany, and Santiago, Chili.

The Western Edison Electric Company have installed several extensive plants, operated from central stations, during the past year. Among these are the Cities of Rockford and Elgin, Ill., and Boston, Iowa; McVicker's Theatre, the new Chicago Opera House and City Hall have recently been illuminated by the same means. The Washington street and LaSalle street tunnels are lighted also from the City Hall plant, and the fact that they are daily traversed by hundreds of people who assumed them before is substantial testimony to the infinite superiority of the electric light.

## SAWYER.

In a letter published in the New York "Herald" of August 10th, 1880, Mr. W. E. Sawyer expressed his opinion regarding Mr. Edison's invention of incandescent electric lighting as follows:

Professor Edison claims that he can supply his electric lamps at thirty-five cents apiece. Perhaps that is so; undoubtedly Professor Edison is able to give them away. But, nevertheless, his lamps to-day cost him ten times that amount, and when it was announced (without authority, of course,) that their cost was twenty-five cents apiece it was really not less than 85 or 90 for each and every working lamp. It is stated that the average power of the Edison lamp is fifteen and a half candles, and certain professional gentlemen have ascertained ten argand lamps per horse-power, each of a power of twelve candles, or an average in divided light of 120 candles per horse-power. This is a serious error, on account of which the aforesaid professional gentlemen are entitled to our profoundest sympathy. If one of them were to tell a steamboat that it is as cheap to run a boat ten miles an hour as five he would be laughed at; but these great intellects experience no misgivings whatever in inferring the public that it takes as little power to overcome an electrical resistance of 120 ohms (as in Professor Edison's lamp) as it does to overcome a resistance of one or one-half or one-quarter of an ohm. What renders the voltmeter a lamp and generator of dielectric much more powerful (and therefore cheaper, since the expenditure of steam power is the same in both cases) than the lamp and generator of another? It is the low resistance of his arc and generator. Why is a Maxim or a Hochmann or a Siemens an more powerful with the same expenditure of steam power than that of others? Because their arcs are, so to speak, "short and thick" of great quantity and low tension, while the failures are found in lamps of high resistance, and high tension is necessary to overcome high resistance. Electricity operates very peculiarly. If fifteen-ahms of a given current produces ten candle power the whole current (ohm-ohms-ohms) produces more than twenty candles. To make an economical light it is necessary, therefore, that the carbon shall be able to stand the final fraction of current. The first fractions produce but little light. To obtain 40 of the Edison lamps on the steamer "Columbia" required thirty horse-power, and the average light per lamp was less than six candles.

NOTE.—On the steamer "Columbia" the same Edison plant is now in use that Sawyer claimed was furnishing but

one lamp to the horse-power. How well the Edison plant had worked on the steamer at that time will be seen from the report of Chief Engineer Van Duzer, of the Oregon R. R. and Navigation Co., February 24, 1882, to Mr. Edison, an extract from which we give below:

"I have now one hundred and fifteen lamps in circuit, and have up to date run four hundred and fifteen hours and forty-five minutes without one lamp going out.

"The engines being connected to the main condenser when under way, the actual expense felt consists only in the extra plot of oil used in lubricating engines, dynamo, etc. The expense from coal at 80 per ton is about 18 cents per hour for the one hundred and fifteen lights."

The following extract is from a recent paper by Mr. C. J. Kintner, Principal Examiner Division of Electricity, U. S. Patent Office, being one of a series of valuable articles on electrical subjects published by that gentleman. We regret that our space does not permit us to reprint the entire paper:

"... Swaney and Man filled the globe with nitrogen and other non-combustible gases. To follow, perhaps more than to any other modern inventor, belongs the credit of having developed the incandescent lamp to its present point of efficiency, for the reason that he saw the necessity of a complete exhaustion of the globe as possible, and of furnishing each lamp with as high resistance as possible, so that many lamps can be connected in what is known as multiple arc, that is to say, connected side by side between two main conductors, so that each lamp takes its proportion or quantity of the current from the two main wires connected to the dynamo. In arc light systems the lamps are connected in series or tandem, so that when all the lamps are in operation the resistance offered to the passage of the current through the circuit will be equal to that of the conductors joining the lamps plus the sum of the air space made by the separation of the carbons at the arc, so that if, as in the Brush system, we have eighty lights whose carbons are separated each about an eighth of an inch, there will be a total space of 80 divided by 8, or 10 inches, to be bridged by the current. Now, the resistance of an arc lamp varies from three to five ohms or units of resistance. A circuit containing 80 lamps, or about 800 ohms resistance, would require an enormous electro-motive force.

Now, the quantity of current in such a system is a constant factor, while the tension or pressure should vary directly with the number of lamps because the resistance increases in the same proportion.

With incandescent lamps the reverse is true, for the reason that as we add lamps we decrease the resistance, for we are by so doing offering new or additional paths for the current, and each path so added offers a decrease of resistance to the total electric current. Hence in such a system we must keep the electro-motive force or pressure constant and increase the quantity of current, for heat and hence light, as we have seen, is developed directly in proportion to the square of the quantity of current flowing.

In our opinion there is no question as to the feasibility of electric lighting for domestic use. As to its cheapness there can be no doubt, for the reason that the health-preserving qualities of the incandescent light are of such vital importance that the consumer should not hesitate for a moment to consider its cheapness established in point of fact, though the actual cost be double that of gas.

If we stop to consider that each gas jet in a room does more to vitiate the atmosphere than the breathing of two persons; that it heats unduly in summer time; that danger of fire is four-fold more than with the incandescent light; that for cleanliness gas is not to be compared with it; that its light is staid, brighter and under upon the eye; that it is more like sun light than any existing artificial light, and that it is odorless, we will not hesitate to accept it at any price within our means.

There is no question but that the systems of incandescent lights are feasible in sections where the power can be centrally located, and particularly is this true where water power is available.

We prophesy a wonderful future for this kind of lighting, and this, too, not far distant.

#### WESTON VERSUS EDISON ON ARCADES.

Edison's Electrical General.

To the Editor of the Scientific American:

I can scarcely conceive it as possible that the article on the above subject in last week's SCIENTIFIC AMERICAN could have been written from statements derived from Mr. Edison himself, inasmuch as so

Edison's Electrical General.

To the Editor of the Scientific American:

I enclose in your last issue a communication from a gentleman named Weston denying certain results which I had stated to the writer of the criticized article regarding the efficiency of my dynamo.

many of the advantages claimed for the machine described, and statements of the results obtained are so manifestly absurd as to indicate on the part of both writer and proprietor a positive want of knowledge of the electric circuit and the principles governing the construction and operation of electric machines.

It is not my intention to criticize the design or construction of the machine (not because they are not open to criticism), as I am sure, and have been for many years, engaged in the manufacture of electric machines, but rather to call attention to the impossibility of obtaining the described results without destroying the doctrine of the conservation and correlation of force.

What the "important fact" is developed in the course of Mr. Edison's experiments with this generator is (if it means anything more than what Heford, Wilde, Siemens and Whistone set forth many years ago) I am unable to comprehend from the description given. It is stated that "the internal resistance of the armature" of this machine "is only 1 ohm." On this fact, and the disproportion between this resistance and that of the external circuit, the theory of the alleged efficiency of the machine is stated to be based, for we are informed "that while this generator in general principle is the same as in the best well-known forms, still there is an all-important difference, which is that it will convert and deliver for useful work nearly double the number of foot pounds that any other machine will under like conditions." The explanation of this remarkable efficiency I quote: "Now the energy converted is distributed over the whole resistance, hence, if the resistance of the machine is represented by  $R$ , and the external circuit

electric machine. His statements are without sense or science, and plausibly originate from one who does not understand the laws which he pretends to set forth. I repeat the report of Mr. Edison, my assistant, who has made all the measurements with the Paraffin machine.

T. A. EDISON.

Nicola Park, N. J., October 23, 1878.

Mr. Edison: I have read very carefully the communication of Mr. Weston, which you handed me to report upon. It is impossible that the statement quoted by him, that your machine delivers nine-tenths of the electrical energy outside is mathematically absurd, when it has been found to be practically true.

The assertion that a machine working with nine times more external than internal resistance must be "capable of increasing its own electro-motive force nine times without an increased expenditure of power" is utter nonsense. Mr. Weston has evidently confounded the obtaining of a maximum of current with the obtaining of a maximum of economical efficiency. A Paraffin machine with a constant field may be considered electrically when running at a fixed speed, as a battery with a certain  $E$ ,  $R$ ,  $P$ , and internal resistance. Your machine, for example, has 100 volts electro-motive force and about half an ohm internal resistance. According to the reason, lying in the better in question it would be mathematically absurd to connect a battery with  $R$ 's resistance nine times greater than itself, and "destructive of the doctrine of the conservation and correlation of force," since doing this with a battery is exactly similar to what you have done with your machine in the case mentioned.

by 9, then of the total energy converted nine-tenths will be useful, so it is outside of the machine, and one-tenth is lost in the resistance of the machine."

How any one acquainted with the laws of the electric circuit can make such statements is what I cannot understand. The statement has quoted is mathematically absurd. It implies either that the machine is capable of increasing its own electro-motive force nine times without an increased expenditure of power, or that external resistance is not resistance to the current induced in the Edison machine.

Does Mr. Edison, or any one for him, mean to say that—establishment to obtain  $\frac{E}{R}$ , that  $C$  is not— $\frac{E}{R} + R$ ?

If so, Mr. Edison has discovered something more than perpetual motion, and Mr. Kely had better retire from the field.

Further on the writer gives another example of this mode of reasoning, when, emboldened and satisfied with the absurd theory above stated, he endeavors to prove the cause of the inefficiency of the Siemens and other machines. Conclude the writer of the article as he

since  $C = \frac{E}{R}$ , that by  $\frac{E}{R}$ , or by making  $R = 9r$ , the machine would, according to his theory, have returned more useful current to the circuit than could be due to the power employed (and in the note indicated), so that there would actually be a creation of force!

If such statements as these have been made by Mr. Edison to the representatives of the daily press, I think he has no cause to complain of the treatment received, but rather

To express the results with equations, the outside work may be taken as equal to  $10^9 (r+R) \times R$ . This will be a maximum when the equation of condition, that the first differential coefficient is equal to zero, established, or— $10^9 (r+R) - R^2 = 0$ , which is the case when  $R = r$ . This shows the maximum is obtained when the external resistance is made equal to the internal. An experimental proof of this was given in a recent number of *La Lanterne Electrique*. For example, in your machine there should be a maximum theoretically when  $R$  equals 0.5 ohm,  $E$  equaling 100 volts, or when  $100 \times 10^9 \times 0.5 \times 0.5 = 25,000,000,000$  foot pounds.

$1 \times 1 = 30,000$  horse power can be utilized outside of the machine, while as many are lost in the machine. Again, if  $R = 10r$ , as in the case mentioned for illustration in the SCIENTIFIC AMERICAN, that is,  $R = 4.5$  ohms,  $100 \times 10^9 \times 4.5 \times \frac{1}{4.5} = 10,000,000,000$  horse power can be utilized outside of the machine.

In the first case, as compared to the second, 25 times as much power is lost in order that 25 times as much useful effect may be obtained.

Seeing that Mr. Weston has failed to substantiate this statement, though expressed clearly in the article he criticizes, his talk about your denying the truth of Ohm's law is highly ridiculous, as well as his denials about expecting or receiving electrical energy. His placing a few letters and equations in his letter makes more absurd the total lack of power he has to supply them.

FRANK H. UYTON.

Mr. Edison was the pioneer in announcing and using his ridiculous assertions in combination with high resistance stout fields, and high re-

to consider himself fortunate that he has escaped rougher handling. In conclusion, allow me to say that if Mr. Edison thinks he has accomplished so much by the reduction of the internal resistance of his machine, that he has much more to do in this direction before his machines will equal in this respect others already in the market.

RAYMOND WEAVER,  
Newark, N. J., October 13, 1879.

*incandescent lamps, notwithstanding the clamor of such contrivances as Water, Sawyer and others.*

*As soon as Mr. Edison had demonstrated by practice the necessity of low resistance structures, others were not slow to copy this failure. The result was of the largest Edison dynamo in 1878. Low resistance is an absolute necessity in armatures used for an incandescent system.*

*Since Mr. Weston did not enter into the incandescent field until 1884, this will account for his want of knowledge of the requirements for incandescent lighting.*

#### UNRELIABILITY OF GAS.

On December 9, 1885, the Kansas City, Mo., Gas Works exploded, leaving the town in entire darkness. The Kansas City "Times" of December 11th, 1885, prints the following editorial:

##### Is It So Much to be Regretted?

The disaster to the works of the Kansas City Gas Company may be properly considered, in its immediate effects, a public calamity; but looked at from a future point of view it is seen to contain a good deal of unshared good for the city. While we are of course sorry for the loss which the explosion inflicts upon the stockholders of the gas company, we cannot say that we regret it from any other cause. In spite of the unrelieved darkness which must envelop the streets of the city for a short period, we believe we are safe in saying that local pride will be glad of the unhappy destruction of the gas supply in that it will cause the number of electric lights to increase with wonderful rapidity. All of us prefer the electric light to gas. It will give a much better appearance to the city and will be more satisfactory in every way.

Kansas City is far behind other cities of equal importance in the number of its electric lights, and on the whole we are inclined to believe that the calamity to the gas company should be considered a matter of con-

gratulation to the city. It will be productive of more electric lights than would have come to us in five years of ordinary progress. Already the Cable Railway Company, the hotels, opera houses and many retail and wholesale firms have about decided to introduce the electric light and the Kansas City Electric Light Company is overwhelmed with applications for lights. The City Council has provided for the lighting of Main and Delaware streets by electricity, and it is not probable that the lights contracted for will ever be removed. On the contrary, their heavy and useful work will no doubt operate to largely increase their number.

The gas company will rebuild its works and do a profitable business, but it is safe to say that hereafter, in the business portion of the city, the electric light, incandescent and otherwise, will be the rule instead of the exception. "The Times" will not long enjoy the envied distinction of possessing all by itself the best light in the city, and in the interest of the public "The Times" is willing to relinquish that honor.

(NOTE.) The "Times" building is lighted by 550 Edison lights which give entire satisfaction, as the following news item will show:

In the evening the building was lighted with the Edison Incandescent Light, and until late at night large crowds stood on the sidewalk and manifested a great deal of interest in the new lights and remarked on their superiority over the old style of gas or even the electric light.

The street lamps in front of the building on the Main street side and on the north side of the "Diamond" point were very greatly admired. They are of the smaller street lamp style made by the Edison Company and give such a pure, soft light that all upon whom their rays were shed last evening stopped to closely inspect them.

The incandescent light is working nicely, thank you.

Come down, all you dilettantes, and see how the light holds out to burn at the junction.

It will be remembered that when Providence wished to show special favor to the chosen few it was ordained that the pillar of the cloud went behind them and gave them light at night, while it was darkness and opposition to the wicked. So now there is light and festivity in "The Times" office, while the city groans and is bewildered.

Besides hastening the execution of an electric light plant by the Cable Railway Company, the organizing of the gas company has given a new impetus to the organization of the Edison Electric Light Company, recently

started by Mr. Ellis, Mr. Edison's Western agent. It is thought the company will be ready to effect a permanent organization in a few weeks.—*Kansas City Times*, December 10, 1885.

#### The Fire-fly of the Navy.

It is published as "possible" that the "Dolphin" will start to-day on a genuine ocean cruise, and that the West Indies are her destination. Ports there are abundant for quick refuge in case of disaster. Her "electric light plant" is positively pronounced a success, and it is announced that she will move as "an immense fire-fly" to attract the attention of foreign fleets in those waters.—*Editorial N. Y. Herald*, December 16, 1885.

(Note.) The "Dolphin" is lighted with 172 Edison lamps.

#### BOSTON SUGAR REFINERY.

The Edison Company for Isolated Lighting is installing an additional 150-light plant in the Boston Sugar Refinery, East Boston, making altogether—when the new equipment is put in—a total of 210 incandescent lamps. The initial plant of 60 lights, furnished by the Edison Company in the above-mentioned concern, has been running satisfactorily for several months, hence the demand for more lamps.—*N. Y. Electrical World*, Jan. 9, 1886.

[*Cincinnati Commercial-Gazette*, January, 6, 1886.]

#### COMPARATIVE COST OF GAS AND ELECTRIC LIGHT AT CENTRAL UNION DEPOT, CINCINNATI, OHIO.

The announcement was made some time ago that the Central Union Depot had turned off the brilliant incandescent lights in use in the offices and train shed, and were making a test of the difference of expenses between these lights and gas. The following are the figures of Secretary T. O. Barbour, of the Central Union Depot and Railway Company:

Gas consumed in eight days.....	\$407 28
Fuel used for pumps and heating.....	\$40 02
Electric light bill eight days.....	\$70 71
Food, repairs, heating and engine.....	\$185 50
Less fuel used for pumps and heating as per eight days during which gas was used.....	60 02
	60 02
	\$48 20

Difference in favor of electric light, eight days.....\$153 90

The electric lights are very popular with the writing force, and as the saving is about \$650 per month, they will continue to be used, and increased when necessary.

The above plant was installed by the Edison Electric Light Company of Cincinnati, July, 1884.

#### BALLS OF FIRE.

The New Incandescent Lamps at the Bates Mills—The Edison Isolated Incandescent Electric Lighting System.

[*Lawson Evening Journal*, Nov. 9, 1885.]

An Edison's electric lighting plant of 298 lights has just been put into the Bates Mills in this city—the system used being known as the "Edison Isolated Electric Lighting System."

The lights are first seen by a visitor in the office of the mill. They hang over the desks of the paymaster and the clerk. They are of twenty candle-power each and are the familiar, small, pear-shaped globes in which a horse-shoe filament of carbon brightly glows. They can be moved as readily as a kerosene lamp from place to place within the length of the wire and can be handled familiarly without fear of burning or electric shock. In the mill, used in conjunction with the arc-light, they make the ideal light. The trouble with the arc-light, in a mill, is the sharp shadow thrown upon under-portions of the work. The incandescent can be seen hanging on hooks over the looms. They are about half as big as a man's fist. It is a queer sight to see the man at the loom take as big as a man's fist. It is a queer sight to see the man at the loom take the ball of fire from the hook and push it among the threads of the work, turning it in any position, upside down, to the left or the right, indifferently. There is no danger from configuration, for there is nothing ignitable about the lamp. A coil of wire suspends the lamps

from the regular wire of the current and hangs on the hook beside the lamp. For a concentration of the light upon a point nothing equaling it can be elsewhere found. The color is clear white. Throughout the mill and office 208 of these lights are in operation.

The dynamo is a complex machine, greatly simplified in appearance. The dynamo at the Bates requires about 80-horse power to operate it. The average result is eight lamps to a horse power, or 160 candles to a horse power. The dynamo machines at the Bates make 1200 revolutions a minute. Most curious and interesting are the switch machines and the automatic regulator which are fixed to the wall a short distance from the whirling dynamo. In the regulator two lamps are to be seen, alternately shining and then in darkness. The automatic regulator makes the current even, by tarding the surplus into these two lamps. It is controlled by an ingenious system of magnets. The switch box enables the operator to shut off all of the lights on both sides of the mills and keep burning the lamps along the centre.

The dynamo, unlike the arc system dynamo, can be handled fearlessly without danger of shock. To thus handle an arc-system dynamo would be a dangerous shock. The lamps can individually be shut off by a stop similar to the stop-cock of a gas jet. The light ceases, the filaments glow red-hot a second or two and then die out. The lights in the automatic regulator on the wall in this way shine and die out, like fire-flies in the summer night.

"Bring a bucket of water," said the operator.

The water was brought and a light was let into it until it rested on the bottom where it glowed as though in the open air.

The lights can be handled in any way and transferred from one place to another without trouble. An index on the dynamo shows how many lights are burning. When the "Journal" was there 200 were in operation. The single lamp will burn 1000 hours before the carbon filament becomes disintegrated. For a house or a hall, nothing like the handiness and comfort of such a light is known. In the office of Mr. Pratt, the agent, is a study lamp. The carbon filament is surrounded by a porcelain globe, instead of a globe of white glass. The globe is on a heavy brass ornamental stand. It can be moved from place to place about the table, and the light is as mellow as the autumn sunlight and of great clearness.

A plant has been in operation in the Wornout Mills, at Lisbon Falls, for a considerable time. The plant at the Bates was put in by Sidney H. Palmer, Esq. of Boston.

The possibility of accidents by fire with this light is now obliterated entirely. Probably the same can be said for no other kind of light in existence.

Four sizes of lights, 10, 12, 16 and 20 candle power, are made by the Edison company. The plant gives the greatest satisfaction.

#### WILMINGTON, DEL., CENTRAL STATION.

Details have been furnished us by Mr. Paul D. Dyer, Electrical Engineer at the Armonx Electric Light Co. Station, relative to the operation of their Edison plant.

The 1,600 light Edison Central Station, owned and operated by the Armonx Electric Lighting Company of Wilmington, Del., commenced all night lighting Dec. 1st, under most promising circumstances.

Machines and instruments worked satisfactorily, and lamps in various sections of the district burned at even candle power, as shown by a standard volt meter.

The station is one-half mile away from where we supply our first light.

Our customers became so numerous and urgent in their demands for immediate service that our force was compelled to work Sundays and nights.

The rush still keeps up and will until our entire plant is absorbed.

We have contracts to light 102 different places up to date, with a total of 880 lamps, an equivalent of 1,200 lamps of 10 candle power.

The Armonx Co. have been running an arc light plant of 60 lights for over three years.

These lights were still going in conjunction with the Edison plant after we started up, but a number of stores preferring the luminescent light, we closed up one arc machine and returned it to the factory.

Two others have since followed the first one, and notice has been sent to consumers of the last 15 lights that arc light service will be suspended next week for good.

This company is already considering the construction of another station more centrally located.

Gas, \$1.50 per thousand feet, and unusually good.

# EDISON CENTRAL STATION AT ST. ETIENNE, FRANCE.

[From the *Bulletin International des Telephones*, Paris, Nov.  
16, 1886.]

We have the pleasure of announcing to our readers to-day that great progress has been achieved in the electric light, in France.

The Central Station installed at St. Etienne, the dynamos and electrical apparatuses by the "COMPAGNIE CONCENTRIQUE. EDISON," and the boilers, engines, &c., by the firm of Y. Blérick & Co., are running in perfect order at the hour we are writing.

The experiments which have been made during the past month or more have already insured the success of this great enterprise; in reality, the Eden Concert Hall, all the large cafes and the principal stores embraced by the district are already illuminated.

The new light is eagerly adopted, so much so, that the Eclairage Electrique Lenoir Co., or St. Etienne, has already extended its district to connect streets which were not in the original project.

The central station has been installed in a large court in "du Treuil" street, new buildings having been erected for the purpose. Considerable difficulties presented themselves in establishing so important a motive power in the centre of a city, but these have been happily overcome by the measures adopted for the arrangement of the plant, which are well worthy of remark.

On a level floor are placed four boilers, each of 150 h. p. capacity. The partition walls, necessitated by the rules, and which must be separate, extend about 6 feet above the boilers and serve, at the same time, as foundations for four engines of 110 h. p. each. By this arrangement the steam enters the cylinders perfectly dry, no flow of water being possible.

On the level of the top of these partition walls is the floor of the dynamo machine room.

The four Edison dynamos, each of 500 lamps of 16 candle power capacity, are controlled by regulators, with all the necessary switches for connection and disconnection, to insure the independence of each dynamo, and, also, of each engine.

Adjoining the machine room is the laboratory, where the distribution boards are placed. An amperé meter, to indicate up to 600 amperes, is inserted in one pole of each dynamo, which indicates the load carried or work being done by the respective machines.

Over the Field Regulators the volt meters, which indicate the electro-

motive force of the circuit, are placed. This ingenious apparatus contains two lamps, one red the other green.

When the electro-motive force increases the red lamp lights up, and, in the reverse case, the green. The apparatus is adjusted to a fixed electro-motive force, so indicated as long as neither lamp is burning. Immediately a variation occurs, one of the lamps lights up, and, at the same time, a bell rings loudly, attracting the attention of the attendant in charge.

The current passing through the principal conductors is conveyed over the feeders, and distributed through the mains to all points of the district.

It would take too long, in this first article, to describe all the details of this network, but, for the present, we can state that the system of distribution gives the best results in the entire district, the lamps having an uniform brilliancy and perfect steadiness.

The number of lamps lighted at the start was about 2,000, but the boiler and engine capacity is sufficient for more than 5,000, which number we can predict will be connected during the approaching season.

The work of installation was begun last July, and, notwithstanding its magnitude and importance, has been finished in a short space of time.

To sum up, for the first large central station installed in France, we are happy in recording a complete success, which, we hope, will stimulate similar enterprises.

The promoters of this undertaking, the capitalists who are personally interested, the Municipal Council who have favored its establishment, the Edison Company, and Messrs. Blérick & Co. who have made the installation, and the engineer, M. O. Patis, of the Edison Company, who has supervised the work, deserve to be congratulated for their co-operation in a work which marks an epoch in the infancy of electric light.

## THE CENTRAL ELECTRIC LIGHTING STATION OF MILAN.

[From *La Lumiere Electrique*.]

BY G. COLOMBO.

We propose to offer our readers, after eighteen months of regular operation, a description of the Milan central station, together with its

plant, its system of wires, the results hitherto achieved, and those that may be hoped for in the future.

The construction of this central station was decided on towards the latter end of 1883, by a committee selected to introduce the Edison system in Italy, who formed later the existing company, having a capital of \$600,000, bearing the name of the *Società generale italiana di elettricità Sesto-Edison*, with headquarters at Milan.

The company, having purchased a building situated in the street Santa Rudegonda, formerly used as a theatre, began to demolish the theatre and to construct the new station in the month of October, 1883. The work was pushed so rapidly that the station with the first four machines was ready for work in June, 1884, the underground wires having been laid throughout the principal part of the territory to be covered, during the winter. Toward the end of June, 1885, the station began to work regularly every night until 1 o'clock A. M., with an average of 1,100 lamps. In August, 1885, the lighting of the famous *Teatro de la Scala* was undertaken, two machines being added to the existing four, for that purpose; and in November, 1885, continuous service, by day and night, was begun; until by the end of December, 1884, the number of lamps had reached 5,500, equivalent to 4,700 lamps of the normal standard of 16 c. p.

We will divide our description of the Milanese installation, for convenience sake, into the following sections:

1. The central station of St. Rudegonda; 2. The system of conductors; 3. The principal installations; 4. The general working of the system.

### 1.

#### THE CENTRAL STATION OF ST. RUDEGONDA.

This is a rectangular two-story and basement building of 147 x 42 feet, situated between the two parallel streets, *Agostino* and *Santa Rudegonda*. The basement contains the machines, the next floor the boilers, and the top floor the storeroom and laboratory. This is a different arrangement to that usually adopted, which is to place the boilers in the basement, and was dictated by considerations of stability. In consequence of the great speed of the machines.

*The Machine Room.*—This occupies the whole ground floor, and contains at present six machines, with vacuum spaces and foundations for four more, making a total of 10 for the station when it shall be worked to its fullest capacity.

The machines now in use are of the type known as the "Edison C," of which the following are the data:

Maximum current at 110 volts.....	900 amperes
Electro-motive force at the electrodes.....	110 to 120 volts
Resistance of armature.....	0.003 ohms
Resistance of field magnets.....	2.50 ohms
Diameter of armature (D ft. 2 in.).....	2 m. 7 1/2
Length of armature (L ft. 2 in.).....	1 m. 5 1/2
Number of field magnets.....	12

Each of these machines has its own independent steam engine, of which the shaft is the prolongation of the axis of the armature. The normal speed of the armature, therefore, of the engine shaft is 500 revolutions per minute. Of the engines, two are of the Porter-Allen type, and the other four of the Armstrong-Siemens pattern. Each of these machines can develop, at a maximum pressure of eight atmospheres, a maximum force of 130 to 150 h. p., corresponding to the demand, of 1,500 lamps of 16 c. p. per dynamo. A small separate steam engine actuates a ventilator for the circulation of the dynamo armatures, and a steam pump sends a current of cold water through the interior of the frame and foundations. These means of refrigeration are only needed when the machines are developing their maximum work.

All the dynamos are coupled in quantity to two principal conductors of 1,700 square millimetres (2.6 sq. in.) section, and connected by means of the necessary switches and flexible copper conductors to the regulators and to the indoor test circuit, and to the two exterior feeding conductors, which enter the building at the opposite corners of this room. A current regulator is provided for each machine. Each regulator is formed of 50 bobbins, coupled so as to interpose in the field circuit of each dynamo a resistance varying from 1 ohm to 71 ohms in all. The regulation is accomplished by hand, either for each dynamo singly or for all at once, by means of a common shaft which rotates all of the contact arms. These are movable over the six discs of the regulators, each having 37 connectors representing 37 degrees of strength of current. Two indicators of electro-motive force, with electric bells, and two tidal voltmeters are used by the persons who have charge of the regulation of the current. These instruments are regulated by a standard voltmeter, graduated by means of a standard Daniell cell and by a Thomson reflecting galvanometer. By this means the current is promptly regulated without alteration in the quantity of light furnished, even when the greatest alterations are made—such, for instance, as the sudden lighting or extinction of hundreds of lights at a time, for scenic effect in the *Teatro de la Scala*. A local circuit, called the test circuit, is arranged so as to be traversed at the will of the attendant by the current from each of the dynamos. On this circuit are connected



1,000 lamps, or as many as should be operated by one machine at its maximum rate of work. These 1,000 lamps can be lit by groups of 50 at a time, by the aid of a switch. At the function of the two principal conductors with the feeding conductors of the system are interposed feeders, which will be explained later in our description of the system of conductors; their function is to equalize the electro-motive force, and consequently the intensity of the light at all points. In this room are also placed the ammeters used to indicate the quantity of current flowing through the system of conductors, and therefore the number of lamps lighted in the territory supplied by the station. These ammeters are simple needles, deflected by the current which passes through the principal conductors, placed beneath them, and can indicate up to 2,000 amperes with a trifling error; they are verified from time to time by standard lamps. Although it would be easy to furnish these ammeters with automatic registering devices, which may be done later, at present it is considered sufficient to read the indications once every quarter hour, as much for regulating the machines then working as for registering the course and amount of the daily work performed. Other apparatus, unnecessary to describe here, serves for direct observations, such as the variations in the electro-motive force at the ends of the feeding conductors of the system; indicators of leakage to earth on either pole of the system of conductors; measures of the corresponding electro-motive force, etc.

**Boiler Room.**—The boilers are installed in the first story, and at present are five in number, of which one is isolated and the other four connected in groups of two boilers each. They are of the Babcock & Wilcox manufacture, perfected in many details by Root. The choice of boilers was determined by the local conditions, which demanded boilers of a pattern at once light, small in comparison with the considerable force required and inexpensive. Each boiler is composed of a group of inclined tubes, connected at the two extremities to horizontal reservoirs of steel plates, from whence the steam is drawn. The interior extremity of the tubes is in communication with a drum, from whence the ammonia passes to the chimney. The principal data of each of these five boilers follow:

Number of tubes.....	90
Number of collecting pipes.....	5
Length of tubes.....	15 feet
Length of reservoir.....	15 "
Surface of grate.....	15 "
Heating surface, newly.....	12 sq. "
Estimated h. p.....	210 "
Total weight.....	42,244 lbs.
Surface occupied.....	60 sq. feet

Space has been left unoccupied for four more boilers, in case the

wants of the service shall render them necessary. The boilers are fed by five Keortig injectors, two of which pump the water from the bottom of a well and empty it into reservoirs situated on the lower floor. There are also two direct-action steam pumps, of which one is ordinarily used for the refrigeration of the machines; but the piping is so arranged that either of these pumps, or both together, may be used for feeding the boilers. The steam pipes are so arranged that other machines can be detached from the others in case of accident, or for repairs.

The smoke from the boiler furnaces is carried to a chimney of 6 feet constant interior diameter, and is 150 feet in height from the street pavement.

Other apparatus is used for the heating and distribution of the coal. The coal burned is the best Cardiff, which produces very little smoke when the furnaces are charged, and practically none during combustion. No smoke-consuming devices are used.

**Organization of the central office staff.**—The direction of the service is confided to an electrician-in-chief, who has under his immediate orders: One or two engineers, according to the season, charged with the oversight of the work; one chief mechanical; one foreman electrician; one foreman mechanical; one foreman of them; and the working electricians (for the communication), steam engineers and firemen. The staff is divided into gangs for day and night service.

During the summer season the number of lamps used in the district during the late hours of the night and during the day is only from 100 to 500; during the winter this number increases, and there are some days on which the lamps are in use by hundreds from daybreak, and in some places of public resort remain in use all night. During the hours when the lamps in use are only some hundreds, a small 400-light dynamo is used. As soon as the ammeters indicate that the number of lamps in use approaches 400, one of the large dynamos is started and the small one stopped. A second dynamo is added when more than 800 lamps are indicated; for, although the dynamo will feed 1,000 lamps, and even more (with the maximum electro-motive force of 110 volts), it is preferred not to charge them in actual service with more than 800 or 900. The same proceeding is repeated in proportion as the number of lamps used in the district increases, until the full capacity of four dynamos is reached, and this has not been extended up to the present time. The remaining two machines are kept in reserve, one of them being run at a reduced speed on open circuit, ready for use in a few moments if the season arises. Experience has shown that the introduction of a new dynamo, or the substitution of one for another, can be made in a few seconds, and in such a

manner than an accident to a machine, such as the breaking or the heating of a part, has no injurious effect on the regularity of the service.

The increase in the number of lamps takes place very rapidly from twilight to 7 or 8 o'clock in the evening. The process above described is reversed in removing dynamo out after another from the streets, when at a later hour the number of lamps begins to decrease. Ordinarily, one hour after the closing of the theaters the small dynamo is put in use.

The normal electro-motive force of the station is shown by the indicators previously mentioned, which act at the end of the feeding conductors is regulated by means of the feed-regulators according to the indications of the ammeters. Thus the direction of the station has completely under his hand the working of the lighting at all points of the system.

All of the statistics relating to the work of the station, as well as the number of lamp-hours, the consumption of coal and oil, etc., are registered daily and tabulated monthly for the information of the engineer-in-chief, and for the administration.

## II

### SYSTEM OF CONDUCTORS.

The central station of St. Radegunde, which, at present, is eccentrically situated in respect to the district served by its conductors, will, on account of recent developments of the system of conductors, soon to be in a central position, with radii of 1,500 feet in all directions.

The conductors are divided into two classes, called respectively *conductors of illumination* (feeders), and *conductors of distribution* (main), the distinctive uses of each being explained hereafter. Each line comprises two conductors, one going and the other returning, that is to say, each line is a tube containing two copper conducting bars separated by an insulating composition, according to the well-known Edison system, which has been previously described in these columns (see page 80).

The organization and manner of calculating the details of such a system are quite different from those required for any other conduits, as for water, air or gas. In such cases we start with a certain initial pressure (in the reservoir, or in the pump), and the conduit is so designed as to lose a certain determined fraction of the initial pressure at the most distant points of the system. We have then at different points of the system as pressure, which is less and less in proportion as the distance from the origin of the conduit. The maximum loss of pressure may represent a considerable fraction of the initial pressure, since we can always proportion the delivery of the water, or gas, by appropriate orifices, which

ever may be the pressure, or rate of flow, and thus compensate for diminished pressure.

For an electric lighting conduit, the problem is entirely different. Admitting, as a general principle, that it is desirable to employ for the service throughout the whole of a system lamps of one standard form, which is equivalent to demanding the same electro-motive force to develop their normal luminous intensity, it is evident that the permissible falls of potential between the two conductors at any two points of the system, must not vary much between themselves, without having lamps which would give a luminous intensity varying too much, according to their positions relatively to the source of the current.

Then, recalling the fact that for the standard Edison 16 c. p. lamp, a difference of one volt in the electro-motive force, is equivalent, at the limits of the luminous intensity, to nearly one candle, one can easily comprehend that the greatest available difference in electro-motive force at any two points of the system cannot, without inconvenience, exceed one and a half or two per cent. It is then necessary to design the system so that this condition may always be fulfilled; and this consideration forcibly excludes the application of the system in use for the distribution of water or gas. Strictly speaking, one could make up for a great variation in the available electro-motive force by using lamps giving the same luminous intensity with different electro-motive forces (that is to say, having different resistances), but that would entail complications in the service, which are entirely inadmissible.

To satisfy the condition stated, it is necessary to divide the system of conductors into two parts: First, a system of conductors called *main*, forming a circuit entirely closed and isolated from the central station; and, second, a system of conductors called *feeders*, which, starting from the central station, carry the current to conveniently chosen points on the main. This might be compared to a distribution of water by a system of intercommunicating canals, into which the water would be carried by feeding trenches proceeding from the source of supply, so as to establish an equal level at all points of the system.

The conductors forming the closed system of mains are those which run along the streets and serve directly for the distribution of the current to the houses of consumers.

They are interconnected by joint-boxes containing fusible lead safety-plugs, calculated so as to interrupt the circuit whenever any cause the delivery becomes abnormal and threatens to heat the conductors above the fixed limit.

The feeding conductors all start from the central station, and are all connected with the mains in joint-boxes of the same sort as those used for

the mains. These joint-boxes have openings flush with the pavement, for the purpose of connecting the joints and of making galvanometer tests.

The designing of a system of this sort can all be done with a battery and galvanometer, in the laboratory. An artificial system, on a reduced scale, is constructed to represent the actual system; the current is passed from the battery by feeding conductors branching to different points and always of the same resistance; then by experiment it is determined which are the most convenient points at which to make the junctions between the feeders and the mains, so that the difference of potential between any two points on the mains shall not exceed the fixed limit. Only, as it is impossible that a system thus planned shall not be subjected to subsequent changes by reason of the addition of new consumers, it becomes necessary to also arrange for the growth of the mains; this requires a somewhat laborious calculation to determine whether one or more feeders shall be supplied, or whether the points of junction between the feeders and the mains shall be displaced.

It was in this fashion that the existing system, planned first in the laboratory for about 3,000 lamps and extending only to the Scala theatre, about 1,800 feet from the central station, has since been enlarged by the addition of two feeders, the displacement of several junction boxes, and the lengthening of all of the mains, so as to suffice for the 5,000 lamps now served, with the possibility of serving 7,000 without any further alteration, at a maximum distance, by the conductors of 1,800 feet, and 1,400 feet in a straight line.

The mains generally run on both sides of each street in the district served by this station, and are buried at a depth varying from 20 to 30 inches beneath the pavement. The tubes containing the mains are of No. 4 size, having two bars of copper of 600 square millimetres (1.44 sq. in.) each and 6 metres (19½ feet) long. The joints are made on the well-known system, by area of copper in cast-iron boxes, filled with the insulating composition. Twelve joint-boxes are used for the mains.

The loops to the houses of consumers are made by boxes of a special shape, from which the conductors are carried either in smaller tubes (Nos. 6, 8, or 7), or by lead-covered cables, and are then subdivided into distributing wires leading to the different places to be lighted.

The feeders are placed at the same depth, branching to the selected points on the mains by the shortest route and connected to the mains by six-joint boxes similar to those used on the mains. The feeders are large tubes of Nos. 14 and 2 size, containing bars of 589 and 448 square millimetres (0.91 to 0.68 sq. in.) section. The shortest is 118 metres (388 feet) long, and the longest 504 metres (1,655 feet). Their resistance is from

0.0101 to 0.0203 ohms. The insulation resistance of all of the underground conductors connected together is 192,000 ohms.

The maximum loss for which the conductors have been calculated is 12 volts, when all of the lamps served by the station are in use. Adding the loss in the installations in the consumers' premises, calculated to be from 2 to 2½ volts for all of the installations, there is a maximum loss of electro-motive force between the dynamo and the lamps of 14 to 14½ volts.

With the great variations in the consumption of the current caused by the addition of new consumers, the opening and closing of theatres, etc., it would not be possible to preserve a constant electro-motive force, even within the limits indicated, at different points of the system, without the use of the feed-regulators at the ends of the feeders in the central station. By the aid of these the greatest variation in the available electro-motive force at any two points of the system never exceeds 2 volts, or less than two per cent. of the standard electro-motive force adopted from the start, which is 102 volts. Thus all consumers of Milan are served by lamps of 101 to 103 volts, limits which are never passed.

The theatre of the Scala being the most important consumer of the system, has been the object of special precautions in designing the arrangements.

Notwithstanding the doubts expressed by many electricians, including Mr. Edison himself, the theatre has been connected directly with the system, although it uses an equivalent of 2,500 16-c. p. lamps and that exhibitions take place there only during the first three or four months of the year. It has been arranged so that it can be operated by an isolated plant if necessary, but up to the present time it remains connected with the general system.

We give below some data as to the extent of the system.

	Feet.
Length of tubes for feeders and mains.....	38,075
Average distance from the centre of gravity of the lighting from the station, measured on the mains.....	1,430
Distance from the station to the centre of the principal group of lamps (Grand Theatre of La Scala) measured on the conductors.....	1,005
Distance from the station to the most distant lamp (Galleria generale) measured on the conductors.....	2,047
Distance from the station to the most distant lamp in a straight line (Hotel Continental and Cercle des Artistes) or maximum radius.....	1,580

## THE PRINCIPAL INSTALLATIONS OF THE SYSTEM.

On January 1st, the system comprised 5,520 lamps, equivalent to 4,745 of the standard 16 c. p. lamps, thus distributed:

	Lamps.
Theatre de la Scala.....	8,350
Theatre Marseill.....	476
Hôtel Continental.....	476
Cercles (clubs).....	335
Cafés and Restaurants.....	725
Banks.....	100
Stores and dwellings.....	610
Total.....	5,520

Of these the most important is that of the *la Scala* theatre. This is the largest opera house in the world, so far as the dimensions of the stage and auditorium are concerned, although the space allotted to the necessary portions not used by the public are somewhat restricted, owing to lack of ground. The stage is 147 feet deep by 121 feet wide. The auditorium is 81 by 71 feet, and 45 feet in height. There are 194 boxes, distributed in five galleries, not counting the upper gallery. The theatre was first opened on August 3d, 1778.

The municipal authorities insisted that the whole theatre should be lighted by electricity, to the entire exclusion of gas, at a time when the central station had just begun operations, allowing only five lamps in the auditorium to complete the installation. Happily, the installation of the Theatre Marseill, just then completed, furnished an opportunity for the study of the apparatus for stage lighting, which was to be used on a ten-fold greater scale at *la Scala*. Yet much special apparatus for the purpose had to be invented to fill the peculiar demands of a stage so vast and where so much luxury is displayed in the mounting of the scenes. The gas was entirely displaced and the theatre wholly lighted by incandescent electric lamps in time for the season 1888-84. The following are some of the details of this important installation: The total number of lamps in the theatre and its annexes is 2,200, of 16, 10, 10 and 8 c. p., respectively, equivalent to 5,250 of the normal 16 c. p. standard lamps. The current is furnished to the theatre as to all other consumers, night and day, and during one season the consumption has amounted in round numbers to 900,000 lamp-hours. Not a single accident to, or interruption in, the service has occurred since its inauguration in November, 1883, up to the present time. A second and much smaller installation is that of the Theatre Marseill—801 lamps—from whence gas is also excluded.

Another installation, that of the Grand Hotel Continental, is, we believe, unique. This hotel is entirely lighted by incandescence, to the absolute exclusion of gas, and even of candles, since every room is furnished with the electric light. Portable lamps with flexible conductors and circuit-closers similar to those used for electric bells, are used. There are 476 lamps here, 32 and 16 c. p. being used for the public halls and saloons, and 10 c. p. for the chambers.

Two or three other installations are now in course of construction, and are rapidly approaching completion. As the gas company in this city has an unrecuprated monopoly, it is impossible to hope for a much greater extension of the system to streets and squares other than those now covered, although the public much desire it. The electric light has, however, brought about a reduction of 40 per cent. in the price of gas within the district served.

## THE GENERAL WORKING OF THE SYSTEM.

When this enterprise was undertaken, there was only one other like it in the world, at New York, and even there the Pearl street station had only just started to furnish light. It follows, therefore, that its operations were conducted slowly, and often tentatively. Nevertheless, it progressed so well that on December 21st last it had a number of consumers which represented an annual revenue of \$40,000.

At the present moment, the capacity of the six machines now installed at St. Badegoule is nearly reached. As the principle has been adopted of always keeping one in reserve, even in the times of greatest consumption (the month of February), and calculating the capacity of the machines at 1,000 16 c. p. lamps, the present equipment will only supply 5,600 of 16 candles, or their equivalent in 32, 16, 10 and 8 c. p. lamps. The station can contain, however, and has fixtures ready for, four more machines and all accessories, capable of supplying, emitting the reserve, 9,000 16 c. p. lamps, or about 15,000 of assorted sizes. This number will suffice for the probable extreme wants of the entire district.

The new machines can be added at a less proportionate cost than the six original ones, on account of the preparation already made to receive them. The cost will be simply the purchase price of the machines and conductors, and cost of laying them. In regard to the conductors, any addition to the number of consumers will result in allowing a more favorable arrangement of the junctions between the feeders and the mains, so that the cost of these will be, per lamp, about 40 francs (\$8.00), as against 55 francs (\$11.00) for the original outlay per lamp. It may,

As to the tariff itself, the system adopted from the start was the most rational and the most convenient that could be adopted for an electric lighting enterprise, especially at its inception. Each lamp installed with consumer represented a capital permanently invested for real estate, building, masonry and conductors. Even supposing that lamp to be used only one hour per year, the installation must provide for illumination that lamp, since it might happen that all of the lamps in the system should be in use at the same time. This is especially true in Milan, because the lamps being obliged in public places, it really happens that in winter, at a certain hour of the night, the greater portion of the lamps are in use. Each lamp installed ought, then, to pay the interest and the cost of renewal of its share of the capital invested, whether used during the whole year or not at all. This constitutes, in consequence, an *annual constant* that each lamp must pay, independent of its consumption.

If the contract is by metre, the consumption is paid by the readings of the meter, which registers the quantity of current or the amperes con-

Annual constant for the 16 c. p. lamp.....	francs.	dollars.
Tariff of consumption:		
Per ampère—hour.....	0.0633	(.01
Per lamp, normal—hour.....	0.04	(.008

It is evident that this tariff favors the largest consumers; not those who have the largest number of lamps, but those whose lamps are used during the greatest number of hours. Thus, for example, a consumer whose lamps burn during 3,600 hours per year (as in the case of street lighting) would pay annually for a normal lamp of 16 c. p. (equivalent to at least 180 litres of gas) a sum of 175 francs (\$35), which amounts, per hour, to

which demonstrates the possibility and even the convenience of applying the electric light to public lighting.

Cafés, restaurants, clubs, etc., have an average consumption of 2,700 to 2,800 hours, which amounts to a tariff per hour of

Stores closing at from 9.30 to 10 o'clock P. M., and having an average consumption of 1,400 hours, would pay per hour:

The price of gas is that of the monopoly accorded to the gas company of Milan, without counting 3 centimes (\$0.04) municipal tax.

cost of the light on a basis of 700 hours per year, the tariff per hour would be:

	Centime.	Cent.
1¢ c. p. electric light.....	9.0	1.8
Corresponding price per cubic metre of gas.....	60.0	12.0

The electric light is in this case cheaper than gas, even at the price assured by monopoly, except in small towns, where gas costs, in Italy, 45 centimes (9 c.), and even 50 centimes (10 c.) per cubic metre. This is also the case with theatres having a small number of representations per year. In Italy, for example, all the large opera houses have a season of forty to sixty representations.

These figures will suffice to give an idea of the conditions in which an incandescent electric lighting enterprise can be established and compete with gas. They certainly do not represent the last word that can be said of electric lighting. In the future we are sure that reductions will be made which will still further extend this grand application of electricity, which is still in its infancy, since there are but two instances of its exploitation on a large and important scale, viz., in New York and Milan.

As the cost of canalization increases rapidly as the distance between the central station and the farthest outlying lamp increases, it is most economical to establish stations in thickly settled districts, so that this distance shall not much exceed 300 metres (975 feet). If this light is to be adopted generally, to the exclusion of gas, a cheaper system of canalization must be devised. There is more than one way in which a practical solution of this problem may be sought; and although this solution may be reserved for the future, there is already one point gained in a fact whose importance surpasses that of all other necessary questions. This fact is the complete and practical success of public lighting by the incandescent lamp, together with the admirable system of distribution devised by Mr. Edison; a success which is hereafter assured by an experience of more than two years in New York and of nearly two years in Milan.

#### INCREASE OF THE EDISON PLANT AT THE NOTRE DAME UNIVERSITY, IND.

[*The Notre Dame Scholastic*, January 9th, 1886.]

We are pleased to announce that the authorities have completed arrangements for introducing the Edison incandescent light into all the col-

lege buildings. In addition to the dynamo now in use, a much larger one has been ordered, and will be put in position in a few days. The Edison Co. is now engaged in "wiring" the buildings, which will include the Main Building, Science Hall, the Academy of Music and St. Edward's Hall. During the past few months about one hundred and fifty lights have been in use; but on the installation of the new plant, the number will be increased to upwards of five hundred. The electric light supersede gas entirely in all the parlors, study halls, class and lecture rooms, as well as in the private rooms of professors and students. We are sure that all will be pleased with the change, as, from the experience we have already had with the Edison light, there seems to be no doubt left in the minds of any one as to the superiority of the incandescent electric light over gas. It is in every way a cleaner, brighter and sturdier illuminant than anything we have yet seen; and, by reason of its brightness and absolute steadiness, it is as easy on the eyes as sunlight itself.

[*Editorial Notre Dame Scholastic*, January 9th, 1886.]

#### The Edison Light.

The Edison incandescent electric light system, including dynamo, lamps, conductors, meters, regulators, and other appliances which go to make up the only system of incandescent lighting which has passed the stage of experiment, and which has a universally recognized commercial value, is a remarkable instance of what energy, persistence and genius can accomplish in the face of apparently insurmountable obstacles, and when the thing attempted is regarded, by the best capable of judging, as impracticable, if not absurd.

When, a few years ago, Mr. Edison announced his intention of producing a light, substantially the same as that which he has since so ably perfected, and which has made him famous—although he was that before—the world ever, he was laughed at by the most eminent scientists of America and Europe, and told that he was attempting what, in the very nature of things, was simply impossible. Electricians, in their wisdom, asserted that he was working contrary to all the known laws of electricity and magnetism. Mathematicians came forward with long and complicated formulas to prove that what he projected implied a nullification of all the well-established conclusions regarding the conservation and of the various physical forces. The laws of Ohm were discussed in all their bearings, the investigations of Amper, Faraday, Arago, Biot, Thompson, Maxwell, Kirchhoff and other eminent physicists, were appealed to as proof positive of the futility of Mr. Edison's efforts. Then, too, he was told of

the signal failure of Starr, King, Kestoff, Ledygreine, and others, who, years before, had gone over the same ground he was exploiting, and had given up in despair what he now confidently promised to bring to a successful issue.

We have before us the challenge of a prominent electrified inventor and writer, in as late as '79 and '80. He offers Mr. Edison \$100,000 if he can do either of the following things: maintain a vacuum in his lamps; run his lamp three hours; prove that his dynamo-electric machine develops even forty-five per cent. of the foot pounds applied to it; show that with his lamp he can obtain two lights of ten candle-power each per horse power.

But the "Wizard of Menlo Park," heedful not the arguments of electrical engineers, or the challenges of would-be inventors. He drew the word of experiment that he knew how to handle so well, and, like Alexander of old, he besotted the Gordian knot in a way that was least anticipated.

With a new form of Sprague's mercurial pump, he succeeded in getting a vacuum, until then unknown, and which for his purposes was almost perfect. Instead of three hours, he runs his lamps, on an average, six hundred hours; and many of them last three and four times that long. In place of forty-five, his dynamo develops ninety per cent. of the foot pounds applied to them. And, lastly, instead of getting two lamps of ten candle-power each, he gives eight lamps of sixteen candle-power each per horse power.

Edison's victory was complete. It was the old story repeated—of genius versus difficulty and the pretended wisdom of doctors in science. Edison's triumph was that of Watt, Stephenson, Fulton, Morse and others, scarcely less illustrious. It was a victory that has not only conferred an incalculable benefit on humanity, but one that teaches an important lesson to those who presume to know everything regarding the secrets of nature, and who are ever ready to die up and proclaim what can and what cannot be done; what is and what is not true; what we must believe, and what we must not believe—and all on their simple *magister dictis*.

#### EDISON LIGHT AT THE GRAND OPERA, PARIS, FRANCE.

[Extract from *London "Engineering," Dec. 4, 1885.*]

In the grand foyer, the Edison lamps are fixed in the existing chandeliers and in the spaces between the burners, so that the gas jets are replaced light for light with the electric lamp. The ten lustres each carry

42 lamps, and the two small salons leading from the foyer, are each lighted with four brackets of 18 lamps each. The foyer and its annexes have altogether 424 lamps. This portion of the installation is now in operation, the foyer having been re-opened to the public since the wall papers were cleared from the deposit that rendered them invisible. The effect obtained is very striking, as each Edison lamp has a power of 10, candle, one-third more than the gas jet it replaces. The small foyer is lighted by five groups of 18 Edison each, fixed to the existing gas lustres. On the staircase are 242 lamps placed upon the different gas candleholders. The auditorium contains six grandoles at the level of the boxes, each with 18 Edison lamps. These form a part of the lighting of the front of the house, as well as 120 Edisons for the footlights; besides these the grand chandelier in the middle of the balcony contains 610 lamps. (This is the largest number of lights on any one fixture in the world.)

The following summary shows the amount and distribution of the lamps:

521	Edison lamps (foyer).
90	" " (small foyer).
312	" " (staircase).
120	" " (footlights).
90	" " (auditorium).
610	" " (central chandelier).

Total—1733 Edison lamps.

To this number have to be added some lamps burning in the cellar where the dynamos and engines are placed, sentinel lamps, &c., so that altogether there are certainly 5,000 Edisons, which replace an equal number of gas burners, and give a far superior light at—it is still—the same cost. As the total number of gas burners used in the Opera exceeded 4,000, it will be understood that the installation at present is far from complete. We shall see further on that the mechanical and electrical installation is adapted to supply current to a much greater number of lamps than are at present in use, and it has been definitely decided to replace, after the present installation has been at work for some time, the whole of the gas burners by electricity.

EDWARD H. JOHNSON,  
President.

No. 14.

## BULLETIN FOR AGENTS.

THE EDISON COMPANY FOR ISOLATED LIGHTING.

65 FIFTH AVENUE.

NEW YORK, JUNE 7, 1886.

### PATENT SUITS.

The Edison Electric Light Company brought suit some months since against the infringers of its various patents which are now pending in the courts. We have heretofore carefully refrained from a discussion, by way of circular or advertisement, of any of the questions involved, believing they should be left for decision of the only forum which can effectively pass upon the rights of the parties in interest, and we would not now depart from this policy but for the fact that the Consolidated Electric Light Company, the owners of what are called the Sawyer-Man patents, have recently published and sent broadcast a circular relating to their patents and their controversy with Mr. Edison in the Patent Office, which is not only false in fact, but admits of no other criticism than that it was prepared and is distributed with the deliberate intention of deceiving the public and of creating a belief which the draftsmen of the circular must have known to be false.

This company has always claimed, and it is generally conceded, that the fundamental and controlling patent on the incandescent lamp is that used and owned by it for the in-



vention of Mr. Edison of the filament of carbon. There was a controversy in the Patent Office between an application for a patent filed by Mr. Edison on December 11th, 1879, and one filed by Sawyer-Man on January 29th, 1880, the issue of the interference and the controversy between them being confined to "*the incandescent conductor for an electric lamp formed of carbonized paper*." The "filament of carbon" was neither directly nor indirectly involved.

The dishonesty of the circular to which we have referred consists in a grouping of statements which, while true in themselves, are so arranged as to create and justify an inference absolutely false.

It is true, as there stated, that this company has advertised that its contest with Sawyer and Man "did not involve the invention of the filament of carbon," that Mr. Edison testified in 1883, "My mind was full of the fact that they were endeavoring to deprive me of the use of a filament of carbon," but the testimony quoted was not given by Mr. Edison in the Sawyer-Man interference, but in an interference now pending between Edison, Maxin and Swan, and some two years after the testimony in the Sawyer-Man-Edison controversy was closed.

On cross-examination by counsel for Maxin, Edison was asked :

"291 x-Q. Did not the Sawyer and Man interference relate to a paper carbon, and was not the question involved therein one of priority between yourself and Sawyer and Man as to the alleged invention of the paper carbon ?

"A. Yes, sir; but at the time the preliminary statement was made I had given the subject very little attention, and my mind was full of the fact that they were endeavoring to deprive me of the use of a filament of carbon, and paper in my mind then was a secondary consideration."

The fact is that after Mr. Edison gave the matter attention and understood that the invention in controversy was only the use of carbonized paper, he considered the controversy of little importance.

It is also true that the decision in the Sawyer-Man interference was, as stated, that Sawyer and Man had the invention in a rule form as early as March, 1878, and completed in September or October of the same year, and that Edison completed the invention and reduced it to practice on or about October 22d, 1879, but the *invention of the decision* was not the filament of carbon, but the *incandescent conductor for an electric lamp formed of carbonized paper*.

Of this studied attempt to make it appear that a litigation involving the filament of carbon had arisen between Mr. Edison and Sawyer & Man and been decided in their favor, we have no further criticism to make, and leave it to the business public to form its own opinion, from the facts, of the integrity of a corporation which thus seeks to enlarge its business by deceiving that public whose confidence it asks.

In reply to the statement of the same circular, that the Edison Co. has never succeeded in obtaining a decision for the infringement of any of their patents against any person or corporation, we have only to say that after a protracted litigation in Germany the Edison patents were sustained, and decision entered in their favor against infringers, and this company confidently looks for the same results here in its suits now pending.

After writing the above a cable dispatch was received announcing a favorable decision in England on the principal Edison lamp patent and the publication of the present bulletin was therefore postponed for a time in order that we might furnish our agents with a report of the decision, which was made in favor of the Edison-Swan United Electric Light Co. against Woodhouse & Lawson. The suit was brought for the infringement of the English patent which corresponds with our United States Patent No. 223,898, that is, the patent for a flexible carbon filament, on which suit has been brought in this country against the various infringers.

In the trial before the English Court, the defense produced all the prior patents and publications which can be used in this country to defeat the patent, but the patent was held to be valid in spite of all these. The nearest previous approach to the Edison construction and what was judicially relied upon by the defendants was a lamp made in England by Swan, which, however, cannot be legally used against the patent in this country, because no description of it was published before Mr. Edison's invention. Even this, however, was held by the Court not to anticipate the Edison claim for a carbon "filament."

This claim has now been upheld in the Courts of two countries—Germany and England—and the result there surely augurs well for a like favorable determination in this country.

The decision will speak both for itself and so therefore publish below a somewhat abbreviated report of it:

His Lordship (Mr. Justice Brett) having remarked that at an early stage of the proceedings he intimated that there was no evidence of infringement of the Swan and Glumington patents, and that, therefore, the validity of these patents was beyond the sphere of the present enquiry, proceeded to deal with the Edison patent. There was one fact beyond contest, he said, namely, that before the date of Edison's specification no good and efficient incandescent electric lamp was made or known. He accepted, without hesitation, because it was also accepted by all the defendants' witnesses, Sir Frederick Bramwell's compendious description of Mr. Edison's invention, viz., that it is a vessel made entirely of glass, containing a carbon filament attached to conducting wires, the wires being sealed through the glass and the vessel exhausted of air to a very great degree. The defendants denied the validity of the patent, and also denied that they infringed it. He had all along been of opinion that there had been no infringement of claims Nos. 3 and 4 in Mr. Edison's specification; and he now also thought that there was no infringement of claim No. 1, but in the view he took of claim No. 2 that question became unimportant. The question of the infringement of claim No. 2 depended on the meaning to be attached to the words "a carbon filament." If these words meant a carbon filament "as described" in the patent, he should hold that there was no proof of its infringement; but he did not so interpret these words. He held them to mean any carbon filament, however made, which pro-

duced certain qualities or properties mentioned in the specification, or necessarily resulting from the description there given; to answer that description the carbon filament must possess flexibility and resiliency, must be of small cross-section, offering a high degree of resistance to the passage of the electric current, and must present but a small surface from which radiation of light could take place. He was disposed also to think, but refrained from giving a decided opinion, that the degree of resistance must not be less than 100 ohms. Taking this interpretation, as correct, it was clear there had been infringement by the defendants. Taking Mr. Hawson's evidence, in which he said the defendants used carbon filaments, connected at the ends with platinum wire, in a vessel made wholly of glass, the leading wires passing into and from the receiver being sealed into the body of the vessel, and the air being exhausted to get an good a vacuum as possible; and that the carbon filament used was flexible and as stable at high temperatures as it could be got, but that it was not made by Edison's process—taking that evidence, and applying his interpretation of the words carbon filament, there was an infringement of the patent.

But it was said, assuming the infringement, the defendants are not liable, because the patent is invalid. The first reason in support of the invalidity was, that "a carbon filament," when taken to mean what he had held it to mean, was a description too vague and indefinite, or, in the Solicitor-General's words, was too large. That was an argument to which he could not accede, for he saw no reason why a carbon filament having the properties mentioned in Edison's patent, and which the patentee told the public how to make might not properly be the subject of a patent, although it was capable of being made by methods and of materials other than those set forth in the specification. Secondly, it was said that the specification was not such as would enable the competent workman to make the lamp. The plaintiff's witnesses had stated that in their opinion it would enable him to make the lamp, and Dr. Odling practically admitted the same thing. He held, therefore, that the evidence established that the specification was one which would enable the competent workman to make the lamp. It was next said that a lamp made according to the specification would not be a good lamp; so said some of the defendants' witnesses, but the plaintiff's witnesses gave evidence to the contrary, and the Solicitor-General expressly stated that he did not dispute the ability of Mr. Edison's invention. Under these circumstances he came to the conclusion that a sufficiently good lamp might be made under the specification. Finally, it was said by the Solicitor-General that the patent was invalid, because at the time of the final specification Mr. Edison himself knew of a better method of making the filament than that described in the specification.

tion in question, and in support of that proposition his provisional specification of December 15th, 1879, No. 5227, was referred to. The argument was that he ought to have disclosed the new method in his final specification, which was dated May 10th, 1880, because a patentee is not entitled, on the authorities, and as a matter of good sense, to withhold from the public a discovery of which he is aware, forming an important integral part of his patent, and then take out another patent afterwards for it. So to do would be to put the public to the inconvenience and expense of taking out a license to use two patents, whereas they ought to have had the whole user by taking out a license for one. It must, however, be borne in mind that Mr. Edison did not claim in his patent 4578, for the manufacture of the carbon filament, but for the union of a carbon filament possessing certain properties with the other parts of his combination. There was no evidence that at the time of filing his provisional specification he had not discovered or knew of the process described in patent No. 5227, and he agreed with Mr. Astor, that an inventor has no right to put into his final specification as part of his invention a discovery which he had not made and of which he was ignorant when he filed his provisional specification. He thought, therefore, that the contention on that head could not avail against the plaintiff.

But further, it was alleged that the invention was not new. A number of specifications and publications anterior to the date of Mr. Edison's patent had been adduced as describing either the separate parts of Mr. Edison's combination, or something very like them. But the evidence showed that no one of these publications, unless it were Swan's, contained the combination described by Mr. Edison. In Pulvermacher's specification, which was typical of the others, was a carbon rod or thread, which, if taken by itself, was very like Mr. Edison's coiled carbon filament, mentioned in claim 3, taken by itself. But it was used by Mr. Pulvermacher in a totally different way, and for a totally different purpose. It was curious that Mr. Pulvermacher's patent dealt with two modes of lighting, the arc and the incandescent; and it was very remarkable that, having described in detail the spiral rod or thread for the purpose of the arc light, when he came to state what was his mode of producing an incandescent lamp, he discarded his carbon conductor altogether and resorted to metallic wires. Whatever the likeness between Pulvermacher's spiral rod and Edison's coiled carbon filament, it was perfectly clear to his mind that Pulvermacher was wholly unaware that the coiled thread of carbon could be applied to the purposes of incandescent lighting. With regard to Lane-Fox, it seemed to him that the Solicitor-General was perfectly warranted in saying that it was abundantly clear from the different specifications of Mr. Lane-Fox that he had realized and knew all the elements

that were necessary to make a good incandescent lamp; but it was also true that when he came to prescribe what he would use in his own invention he nearly always seemed to revert to metallic wires for his conductor. He did mention a carbon conductor in one or more of his specifications, but, like Mr. Pulvermacher, when he came practically and finally to deal with the matter, he discarded it and it dropped out of his patent, evidently because he did not not know how to make an efficient carbon conductor.

Passing over the other matters, he now came to the alleged anticipation by Mr. Swan, whose lamp was the only combination at all like Mr. Edison's. Other men of science might have described individual parts of the combination, but some of them had brought all these parts into combination like Mr. Edison had. The law, he took it, was clear. Each individual part of the combination may have been known before, yet, if the combination of those parts be new, the combination may properly be the subject of a patent. But it did appear to him that if Mr. Swan's conductor was practically the same thing as Mr. Edison's carbon filament, then they had in Mr. Swan's lamp the whole of Mr. Edison's combination, and that before the date of Mr. Edison's specification. The main question, therefore, was, were Swan's carbon rod or pencil and Edison's carbon filament practically the same thing? He thought they were not. It was a question of interpretation, and, *per se*, no doubt the meaning of words in a written contract was for the judge. But where technical terms, words of art, were used, the evidence of scientific witnesses and experts in the matter to explain the sense in which they were used might be received. Accordingly each side had called a certain number of scientific witnesses, to whom had been put the question of the meaning of the words "a carbon filament" in claim 2. The plaintiff's witnesses said that Mr. Swan's carbon rod or pencil was not only different from Mr. Edison's carbon filament, but it was totally and wholly different; the defendant's witnesses said the two things were identically the same. In these circumstances he must draw such conclusions on the point as his own unaided light would enable him to arrive at. To his mind it seemed that the carbon pencil or rod was a very different thing from the carbon filament. Mr. Edison's conductor possessed a multitude of cross-section combined with other properties which Mr. Swan's did not. Mr. Edison's conductor possessed a degree of flexibility which was not even approached by Mr. Swan's. Dr. Colling said that in Mr. Swan's lamp the conductor was a rod, but it was a filament too, and in support of this referred to a communication by Mr. Swan in January, 1882, in which he called his conductor a filament. But this, as a matter of anticipation, rather broke short in Dr. Colling's hands, because instead of being an anticipation it

was about a twelvemonth after the event. It could not help thinking that if Mr. Swan, at an earlier period, before Mr. Edison's specification, had known of the various advantages of Edison's carbon filament, as used, his lamp would never have contained a straight rod fixed at each end to platinum wires.

Moreover, there was no evidence to show that before Mr. Edison's specification he knew how to make a carbon conductor of anything like so small a cross section, and which would answer the other requirements stated. The first time he found Mr. Swan's conductor spoken of as a filament was in his final specification of the patent which formed one of the matters of this suit, and that was under the date of July 1st, 1880. Mr. Edison's final specification being seven or eight weeks prior to that. Having the advantage, if he had chosen to use it, of the knowledge conveyed to the public by Mr. Edison's specification, Mr. Swan, some weeks later, called his carbon conductor a filament. A row did not smell any sweeter for being called a row, and the fact that Mr. Swan had subsequently called that rod a filament did not at all convince him that it was properly so called. He did not forget that it was in evidence that electricians had adopted the word filament, and applied it in all manner and kinds of carbon conductors in incandescent lamps. Words often became, when applied to particular trades or sciences, twisted from their original meaning. A dozen at one time meant twelve, but he was not quite clear what it had not been held by the courts in particular trades; it certainly in many did not mean twelve or anything like twelve. So with regard to these matters. An illustration was given by means of a very beautiful flower, a tulip he believed, and he was referred to that portion of it which held and supported the author as a filament, and he was told that in botany that was universally recognized as the filament, of whatever size it might be. That might be. It had acquired that name in botany just as these conductors had since amongst electricians acquired the name of filament, but he suspected it would be found that they had acquired the name of filaments since electricity was introduced and rigidly imposed. On the whole, he had, therefore, come to the conclusion, briefly, that there was no sufficient reason for saying that this patent was invalid on any of the grounds suggested on the part of the defendants, amongst others, of course, that there was no ground for the assertion that it had been anticipated, or, in other words, that it was not new. In the next place, he held, attributing the meaning he had given to claim 2, that there had been a clear infringement by the defendants in their lamp. That being so, the decree he must give was that those of the plaintiffs who possessed the legal and beneficial interest of Mr. Edison's patent, that was to say, his assignees, were entitled to the plea.

## THE FAILURE OF SAWYER AND MAN.

These gentlemen joined hands early in 1878 as inventor and capitalist respectively. They soon, however, rose superior to the statutes, and, *by agreement*, constituted themselves joint inventors. This remarkable paper, dated May 11th, 1878, contains the following premises:

"WHEREAS, contrary to the expectations of the parties, the plans originally proposed by the party of the first part did not prove practically successful, and the party of the second part then came in and made certain suggestions which were generally adopted, and has, from time to time, made suggestions in relation to the subject matter of said agreement, which have been adopted, and through which suggestions it is believed that success has been achieved; and,

"WHEREAS, the parties hereto are unable to distinguish which of them is the author of different parts of the inventions hereinafter referred to."

This is followed by the specific agreement:

"THEREFORE, it is hereby agreed by and between William Edward Sawyer, party of the first part, and Almon Man, party of the second part, in modification of their previous agreement, as follows:

"That instead of the letters patent being taken out in the name of the party of the first part solely, that they shall be taken out in the names of both parties hereto."

The argument of the premises is frequently a fiction framed to fit the covenants that follow; the fair assumption is that Man considered his *inventum* much more certain by this agreed method of procedure. Of course joint inventorship can only arise from participation in the invention, and patents issued to alleged joint inventors, who are such only by agreement, are legally worthless.

The experiments of Sawyer and Man have been productive of more newspaper controversy than of electric lighting. Sawyer's occupation by training and fitness was that of a journalist, and although unsuccessful as an electric light inventor, he retained a deep-seated pride of opinion on that subject, and was ready always to attack vigorously in the daily press any inventor with the temerity to make public

claims of achievements in the direction in which he had so signally failed. Journalism having made him familiar with sporting methods, his favorite attack was the *challenge*. By this means he attacked Edison, and by the same means he gave to posterity a just measure of his judgment as well as of his knowledge of the subject of electric lighting.

Edison having produced his carbon filament lamp, advanced some modest statements with respect to it, which would now be recognized generally as safely within the limits of his achievements at that time. Sawyer proceeded by *challenge*, published in the "Sun" of December 24, 1879, to deny their truth. He states that Edison

"is going over the same ground that Hollingshead, Ledyard, Kodoff, Koon, Starr-King, myself (Sawyer) and others have traversed . . . And Edison has failed, in my opinion."

It can be easily seen that this opinion was based on the results of his own labors.

And then Sawyer becomes specific, and challenges Edison among other things

"to maintain a vacuum in his lamps"

(*Sawyer's lamp with its wax seal was not tight enough to hold nitrogen gas at atmospheric pressure*); and

"to run his carbonized paper lamp three hours. In practice in a perfect vacuum it will last twenty minutes."

(A statement sounded from the depths of his own sombre experience.)

Sawyer followed this up by another attack in the form of an interview, published in the "Tribune," January 2, 1880.

He first qualifies himself as an expert competent to inform the public:

"Having, during the past three years, made the most complete series of experiments respecting electric lighting by incandescence that have probably ever been made, I am enabled to speak positively about many points that to those not familiar, or only partially familiar, with the subject may seem uncertain, or else correct when entirely wrong."

After having plumed himself in this manner, he proceeds to display a lamentable ignorance, not only of correct rules of construction for incandescent lamps, but of quite simple electrical principles.

"First, then," asked the reporter, "what is your idea about the use of platinum for conducting wires?"

"The use of platinum as a holder for the incandescent carbon conductor," replied Mr. Sawyer, "is fatal to the durability of a lamp."

This, he says, is

"for the reason that at a white heat the carbon combines with the platinum to form the platino carbide, and disintegration takes place with great rapidity."

When his attention was called to the fact that Edison's carbon was much longer than that he (Sawyer) had proposed to use, he states that

"when a length of incandescent conductor of one-half inch is reached, the current can no longer be economically used."

Another objection to Edison's long carbon in his opinion was that

"the longer the filament the more current required,"

which to an electrician is a startling proposition. He made this mistake more definite in a letter to the "Tribune," published March 26, 1880.

"Mr. Edison has not yet learned that the greater the resistance of a lamp the greater the power required to operate it."

Returning to the interview of January 2, 1880, Sawyer thought that

"the arrangement of Mr. Edison's lamp in multiple are so as to lessen the external resistance where a large number of lamps are to be run is hazardous."

and he pronounces as his conclusion upon the entire subject that

"no lamp can be practical unless of low resistance."

The fact will be recognized that the features of Edison's lamp and system attacked by Sawyer in this interview are now used by all manufacturers including his (Sawyer's) assignee, the Consolidated Company.

His pride is the opinion that he had himself explored all possible fields of research with that perfect intelligence which few men fail to attribute to themselves, led to a second challenge, published in the "Sun" of January 5, 1880. In this he says:

"Notwithstanding the assertion that one of Mr. Edison's electrical lamps has been running for 240 hours, I still assert, and am prepared to back up my assertion that Mr. Edison cannot run one of his lamps up to the light of a single gas jet (to be more definite let us call it twelve-candle power) for more than three hours. \* \* \* I failure in every particular to my original challenge to Mr. Edison."

With respect to Sawyer's lamp or that of Sawyer and Man the verdict of failure had already been given.

The activity produced by Edison's success aroused Sawyer, and he resumed the experiments abandoned by himself and Man; but he hoped only for a qualified success. He believed that the electric light was capable of limited application only, and that it could not be made suitable for domestic illumination. His position was correctly stated in an article in "The Electrician" of April 17, 1880.

"Mr. Sawyer has now given up the idea of attempting to perform an incandescent light pure and simple. He has abandoned all effort in that direction, after two years of constant experiment. His only hope at present is to be able to manufacture a style of lamp suitable for factories. He has modified the recent lamp in such a manner as to make it substantially a Welsbach lamp, differing therefrom only in the circumstance that the whole apparatus is enclosed in a sealed glass chimney containing nitrogen gas."

It is needless to add that this lamp was also a failure.

Mr. Sawyer could not remain forever wholly blind to Edison's success; he lived long enough to show the better side of his nature by writing a fairly unbiased account of

the history of incandescent electric lighting in his book published in 1881, and entitled "Electric Lighting by Incandescence, and Its Application to Interior Illumination." He indulged in this work his higher literary taste, gratifying the ambition common to all hack-workers of the press, and undoubtedly intended it as a monument to his sincerest convictions.

He says in this book (p. 71):

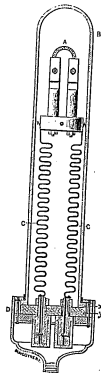
"The Sawyer-Man lamps, as exhibited in New York, were all furnished with carbons of this character (deposited carbons of peculiar shape) and in the perfection of these best-shaped, electrically formed carbons was due their comparative success. To the necessity of frequent renewal and the time and skill required to produce the carbons was due the commercial failure of these lamps." On page 88 occurs this statement: To replace a Sawyer-Man carbon required a workman's time from two to three hours, and the recharging of the lamp with absolutely pure nitrogen cost about seventy cents, without taking into consideration the cost of carbon. It was therefore an impracticable lamp."

The position of Sawyer and Man as inventors in the art of electric lighting, and that of their assignee, the Consolidated Company, in the commercial arena, seems to be accurately stated in an article lately published in "The Electrical World."

"In 1878, W. E. Sawyer, of New York, went over the ground well worn by prior electricians, and produced the improvements in details that have been patented in the joint names of Sawyer and Man. He displayed great ingenuity, but was bound by the dogmas of the art, and sought for the solution of the problem of lighting by incandescence in low resistance carbons, separable globes and inert gases. He produced no new type of lamp, but confined himself to improvements in detail useful only upon the type of lamp then well known. Some intemperance was given Sawyer's experiments by the press, but no more so than the inventions of Starr, Stubb and Ledgins received in their times and in the localities where their lamps were exhibited. Sawyer's lamp was never capable of being put into practical use. THE FACTS THAT HIS EXPERIMENTS WERE CONTEMPORANEOUS WITH THOSE OF EDISON, THAT THE COMPANY INCORPORATED TO EX-

PLOT THEM SURVIVED THE TIME WHEN EDISON MADE LIGHTING BY INCANDESCENCE A SUCCESS TECHNICALLY AND COMMERCIALY, AND THAT THE FIELD PROMISED MONEY RETURNS SUFFICIENTLY LARGE TO DULL THE CONSCIENCE OF CAPITALISTS ALREADY OUT OF POCKET IN THE SAME DIRECTION, ACCOUNT FOR THE PRESENT EXISTENCE OF A COMPANY WHICH MANUFACTURES THE EDISON LAMP AND SEEMS TO SHIELD ITSELF BEHIND THE SAWYER AND MAN PATENTS."

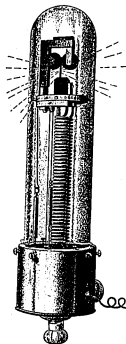
In answer to the numerous inquiries by our agents as to what the Sawyer and Man Lamp is, we show by this cut their lamp, as patented by them May 12, 1885, the application for the patent having been filed January 9, 1880.



Referring to the letters on the illustration, A is a piece of carbon  $\frac{1}{2}$  of an ohm in resistance; the globe B is filled with nitrogen gas, and has its base flange *x* clamped by rings and bolts to the plate *y*; the cup D is filled with wax; the conductors C are known as "radiators," and serve to radiate the heat generated by waste of energy in the lamp.

After the failure of Sawyer and Man, Sawyer alone produced what he called his "feeder" lamp, shown by this cut.

This lamp has the burner of the old Wundermann Lamp placed in a Sawyer and Man structure. Like the Sawyer and Man, Lamp it was a failure.



The following matter, taken from newspapers and technical journals, carries its own explanation. In it will be found the published challenges and letters of Sawyer, before referred to. The italics are our own.

*[From English Mechanic and World of Science, April, 1879.]*

Mr. Sawyer has discovered that his lamp is not such a success as it seemed. The carbon rods still waste and crumble, and the heat cracks the glass tube. He has tried to make rods by placing fine sticks of carbon in

oil and passing a current through. A crust or deposit of very superior carbon is thus obtained, but the cost is considerable, and, when added to the expense of filling the tubes with pure nitrogen, seriously reduces the alleged economy of the system.

[From the *New York Sun*, December 22d, 1879.]

#### Electrician Sawyer's Challenge to Electrician Edison.

If a party possesses an interest in something that he considers valuable, he is not very likely to part with it, especially if it be something in the line of electric lighting, where what may nominally be \$1 may really be \$1,000. Therefore, when Mr. Edison sells out all his interest in his electric light there is a reasonable chance for a suppliant that he considers his invention worth very little.

Mr. Edison's reputation before the public is founded upon the newspaper publications about: 1. The quadroplex telegraph; 2. The telephone; 3. The phonograph.

As to the quadroplex telegraph, I may say that it was an adaptation of the French and German systems. When Mr. Edison took hold of the 4-plex there was already known five systems of 2-plex, three of 4-plex, and three of 6-plex and 8-plex.

The 4-plex of Edison was a failure. A modest young gentleman, Assistant Electrician of the Western Union Telegraph Company, whom I have not seen for several years (Mr. George Smith), made it a success, and some day he will get the credit for this invention; for he, and not Edison, is the genius in this case.

As to the telephone, Mr. Edison is not the inventor. Andrew Graham Bell is the inventor of the telephone.

As to the phonograph, which really made Mr. Edison's reputation, it is of no earthly value, and the manufacture by Bergman has practically been dropped. The real inventor of the phonograph will never be known, in all probability, for I understand that Mr. Edison anticipates a Western man but three days in priority of invention.

Now, all that remains for Mr. Edison is electric light. It is going over the same ground that Bouilligne, Lodygreise, Renfort, Rion, Stern King, myself and others have traversed—first, iron; second, platinum; third, carbon in different shapes. And Edison has failed, in my opinion. To show that I mean what I say, I deny every one of his allegations made at

the Saratoga Convention of the American Society for the advancement of Science, and, specifically, I challenge him:

**FIRST.** To maintain a vacuum in his lamp.

**SECOND.** To run his carbonized paper lamp three hours. (In practice, in a perfect vacuum, it will last twenty minutes.)

**THIRD.** To consolidate platinum by heating electrically in the Sprengel vacuum, as he claims.

**FOURTH.** To prove that his dynamo-electric machine develops not ninety, but even forty-five per cent. of the feet pounds applied to it.

**FIFTH.** To show that he can obtain a light of twenty-five candles from platinum with less than three-horse power.

**SIXTH.** To show that platinum or tellurium will not disintegrate in twenty founts' actual running.

**SEVENTH.** To prove that with his carbonized-paper lamp he can obtain two lights of ten candles each per horse power.

**EIGHTH.** To show that the effect of the oxide of magnesium is to harden his wire, and make it more refractory.

And I further allege that all Mr. Edison's statements are erroneous, and I offer \$500 as a prize for him to prove each of the above eight allegations. Let him run one of his lamps three hours and the public will be satisfied that I am correct.

W. E. SAWYER.

29 Walker street, New York. Dec. 21.

[Editorial from "New York Herald," December 23, 1879.]

#### EDISON'S TRIUMPH.

As might have been expected, the magnificent success of Thomas Alva Edison in developing his electric light, as made known in Sunday's "Herald," has had the instantaneous effect of calling forth the scripping criticisms of rival inventors. A paragraph in one of the city dailies yesterday referred to Edison's invention as a mere modification of the Sawyer-Man patent, and another of our contemporaries, the "Sun," concludes an ill-tempered fling by Mr. W. E. Sawyer, in which he challenges the well-earned reputation of our great inventor in respect to his quadroplex telegraph and his carbon telephone. It is rather late in the day to discuss these points, and we are satisfied to leave them to the mature judgment of the present generation of scientists. But Mr. Sawyer



proceeds to formulate a series of eight challenges to Mr. Edison, offering one hundred dollars premium for a successful answer to any one of them. They cover pretty nearly all the points presented as the distinctive features of Mr. Edison's invention, and if he were so disposed he might double his eight hundred dollars by merely demonstrating them to a committee of Mr. Sawyer's friends.

We do not, however, think it necessary in the year of grace 1879 for any one seriously to discuss a question of comparative originality as between Thomas Alva Edison and W. E. Sawyer. We say this without disparaging the problematical laurels of the latter in his own sphere as an inventor, but we would counsel him not to try conclusions with the "Wizard of Menlo Park." All great inventors have had their rivals and their detractors. What will the men of the twentieth century say if perchance they learn from some obscure volume that the greatest invention of the greatest inventor of all time was challenged by one W. E. Sawyer? Let Mr. Sawyer demonstrate his own inventions as satisfactorily as Mr. Edison, and the world will then listen to him.

As compared with such earping effluence the generous commendations of Mr. Richard A. Proctor, printed in yesterday's "Herald," are refreshing in the generous mind, and the letter which we to-day print from Mr. E. J. Mallet, Jr., is a further testimony from the pen of a thoroughly competent scientist, who has himself experimented in a most interesting manner with the same wonderful element, carbon, which has yielded to Mr. Edison his best and greatest triumph. If any one is authorized to contest with Edison the palm of originality as a carbon-grapher, it would seem to be our correspondent, Mr. Mallet; but his letter, instead of filing a bill of complaint, contains a generous appreciation of the merits of his fellow-physicist. His experiments with platine chloride form a distinct addition to the sum of knowledge in this obscure branch of metallurgy and entitle him to rank as a discoverer. The different attitude of Messrs. Mallet and Sawyer in this respect is deserving of notice, and the public will find no difficulty in awarding the premium for genuine scientific insight and followship.

[From "New York Tribune," January 2, 1880.]

#### MR. SAWYER SKEPTICAL.

#### His Views in regard to the Practicability of the New Edison Lamp.

Mr. W. E. Sawyer, of No. 78 Walker street, in this city, who has made long and careful researches into the problem of the electric lamp, was found at his office yesterday busily engaged in the perfection of a new invention designed for illumination. He is very much interested in the new claims of Mr. Edison, and was quite willing to express his opinion in regard thereto. He said:

"The public has received from Menlo Park the following positive assertions: (1) That Mr. Edison's new lamp consists of a horseshoe of carbon about two and one-half inches long, clamped in platinum holders, and hermetically sealed in a glass globe from which the air has been exhausted. (2) That the horseshoe, consisting of carbonized ink-bottle-board, is so tough and flexible that it can be twisted nearly half way round without breaking. (3) That the horseshoe of carbon, no oxygen being present in the globe, will last an ordinary lifetime; that it has already been run over 100 hours without suffering deterioration. (4) That the light from each lamp is about equal to an ordinary gas jet, or say 10 or 12 candles. (5) That no dynamo machine known can generate sufficient electricity to destroy one of Mr. Edison's horseshoes. (6) That the chief point of advantage in the new lamp is its high resistance—440 Ohms. There are other statements, but the foregoing cover the ground pretty thoroughly. Having, during the past three years, made the most complete series of experiments respecting electric lighting by incandescence that have probably ever been made, I am enabled to speak positively about many points that to those unfamiliar, or only partially familiar, with the subject may seem uncertain, or the correct when entirely wrong."

"First, then," asked the reporter, "what is your idea about the use of platinum for conducting wires?"

"The use of platinum as a holder for the incandescent carbon conductors," replied Mr. Sawyer, "is fatal to the durability of a lamp. Carbon only, of larger section than the incandescent carbon, can be employed, for the reason that at a white heat the carbon combines with the platinum to form the platine carbide, and disintegration takes place with great rapidity. The same is true of any metal. I have used carbon pencils in all shapes, and the best way to establish the connection of the incandescent carbon with its holders is to weld the two together.

This I have done by first clamping the horseshoe in carbon holders, then inverting the lamp and immersing horseshoe and holders in any hydrocarbon, preferably pure olive oil, finally turning on a torrent of electricity, so that the horseshoe is much intensely incandescent. With great violence the oil is decomposed, the hydrogen escaping, and the carbon being deposited, most rapidly, at the points of contact of the horseshoe and its holders. The weld is so perfect that the horseshoe will break anywhere else rather than at the joints."

"Mr. Edison's paper carbon is very much longer than yours, Mr. Sawyer?"

"Yes, and when a length of incandescent conductor of one-half inch is reached, the current can no longer be economically used, because to increase the size is to increase the radiating surface, and the short carbon can be made to give all the light desired, viz, from 25 to 250 candles."

"What do you think of the kind of carbon which Mr. Edison employs?"

"The denser, harder and more homogeneous the carbon the tougher it is and the more durable the lamp for the reason that the whole action of the current (that very action which produces light, an intense vibration of the atoms or molecules of the carbon, amounting to several hundred trillions of vibrations per second) is to disrupt and disintegrate the carbon. The carbon formed by the process discovered, in my experiments, is the only one thus far that offers hope of permanency—a fine pencil of carbon being immersed in olive oil or any hydrocarbon gas or liquid, and electrically heated in the process of welding before described, whereby it is built up with carbon so hard and homogeneous that it may be polished like jet. As we descend from this we get less durable material, the order of durability being: a. Carbon deposited by electric action; b. The hardest retort carbon; c. The best artificial carbon; d. Hard coke; e. Dense charcoal (charcoal impregnated with syrup and then syrup carbonized); f. Willow, paper and other fine charcoal; g. Ordinary charcoal; h. Graphite. Mr. Edison's carbon belongs to the class c or and as carbon in all its forms is extremely brittle his statement that his paper carbon is so tough and flexible that it can be twisted half way round, &c., without breaking is open to criticism. The best carbons of the charcoal order we have produced by impregnating

with syrup the finest French willow charcoal, used by artists, and carbonizing the same, repeating this process a sufficient number of times. This is substantially the process of Pyral and of Gamelin. In pencils of 1 inch diameter and 1 inch length, with perfect carbon connections, and in an atmosphere of pure nitrogen, not even the <sup>1,000,000,000</sup> of oxygen being present, these carbons will last as follows, under the action of the electric current: a. At a red heat, giving a light of perhaps 1 of a candle, 100 to 200 hours; b. At between a red and a white heat, giving a light of 1 or 2 candles, 20 hours; c. At a white heat, light 4 candles, 5 hours; d. True carbon incandescences, when the pencil has the limped appearance of the sun, and gives a light of 25 or 30 to 200 candles, 20 to 1 minute, or even less than 1 minute, disintegration then occurring very rapidly but no consumption taking place. The smaller the section of the pencil, the shorter its life. The larger the section the more current required. The thinner the pencil the more current required."

"Do you think that the horseshoe lamps are liable to be injured by an accidental and sudden increase in the strength of the current?"

"When a carbon is in a high state of incandescence," replied Mr. Sawyer, "double the current invariably ruptures or disintegrates the carbon. If Mr. Edison will only bring the current necessary for ten of his lamps suddenly into one of them he will be surprised at the beautiful manner in which it will disappear. Experience has demonstrated that, while reasonable bounds, the less the resistance of an electrical circuit, which includes the resistance of the wires of the machine and that of the lamps outside of it, the less the power required for effective work. The arrangement of Mr. Edison's lamps in multiple circuit so as to lessen the external resistance where a large number of lamps are to be run is hazardous. In running 5,000 lamps by a single generator, the men will be found in a square of fifty in series and fifty in multiple. This would make the external resistance of Mr. Edison's circuit 140 O., requiring an intensity of current that would give violent shocks to those who might by accident touch the conductors, and a most early insulation of the main wires. To place less lamps in series and more in multiple is as hazardous as to go the other way, inasmuch as it would increase the chances of a short circuit extinguishing lamps in other series. No lamp can be practical unless of low resistance."

[From the New York Sun, Monday, January 6, 1880.]

Mr. Edison challenged by Mr. Sawyer.

To the Editor of the Sun—Sir: Notwithstanding the assertion that one of Mr. Edison's electric lamps has been running 240 hours, I still assert, and am prepared to back up my assertion, that Mr. Edison can not run one of his lamps up to the light of a single gas jet (to be more definite let us call it twelve-candle power) for more than three hours. To be still more definite, I offer to Mr. Edison, at 220 West Fifty-fourth street, in this city, an opportunity to prove what he says. From the private residence in that street wires are run a circuit of 1,000 feet. Mr. Edison shall have every facility; he shall use my wires; he shall have my dynamo-machine or other generator of electricity he may prefer; and all I ask is that the power of his light shall be measured by a photo-meter; that, once in place, it shall not be interfered with; and that a committee of gentlemen, preferably nominated by the editors of the New York press, shall be present and certify to the facts of the test.

Furthermore, I will place one of my lamps side by side with Mr. Edison's; it shall be run at the power of twenty-five candles! It shall outlast the entire forty lamps at Mundy Park, run at the power of twenty-five candles; my lamp to stand as it is put up, and Mr. Edison to put up a fresh lamp as fast as the preceding lamp shall have burned out.

I am anxious for this test; and if Mr. Edison has really run one of his horse-shoe lamps 240 hours he will not refuse to accept my offer, for he will be treated with the utmost courtesy, and shall have everything his own way.

I adhere in every particular to my original challenge to Mr. Edison.

W. E. SAWYER.

78 Walker street, New York, Jan. 4.

[From the New York Herald, March 21, 1880.]

Edison's Electric Light.

The Board of Inquiry, of which Professor Rowland, of the Johns Hopkins University, and Professor Barker, of Pennsylvania, are members, will shortly make a report on the results of the tests to which Edison's new carbons were put. The investigation was made to find out the dura-

bility and economy of the lamp, and as the investigators are bound by an agreement to publish their report, whether favorable or unfavorable, considerable interest is awakened as to how the lamps stood the test. The following is a table showing the number of hours fifty-five of the lamps have been burning. The letter B is placed after those that have broken during the trial, and the others are still intact:

No.	Total Hours.	No.	Total Hours.
1.....	1,200	20.....	214 B
2.....	1,184	21.....	220
3.....	1,194	31.....	628 B
4.....	1,169	32.....	700
5.....	600 B	33.....	724
6.....	1,179	34.....	724
7.....	142	35.....	1,000
8.....	1,200	36.....	1,089
9.....	1,224	37.....	658
10.....	1,113 B	38.....	658
11.....	1,072	39.....	658
12.....	658 B	40.....	470 B
13.....	610 B	41.....	1,032
14.....	710 B	42.....	600
15.....	601	43.....	600
16.....	1,032	44.....	614
17.....	730 B	45.....	600
18.....	652	46.....	754 B
19.....	1,890	47.....	819
20.....	919	48.....	600
21.....	1,641 B	49.....	881 B
22.....	1,198	50.....	882 B
23.....	650 B	51.....	600 B
24.....	650 B	52.....	730 B
25.....	650 B	53.....	600 B
26.....	649 B	54.....	600
27.....	620 B	55.....	600
28.....	754 B		

[From the New York Tribune, March 26, 1880.]

W. E. Sawyer on Edison's Light—Some of the Incredible Claims of Professor Barker Denied.

TO THE EDITOR OF THE "TRIBUNE":

SIR—It may have been a wise move on the part of the managers of the Edison electric light to organize a Board to report upon its merits. The

public not being supposed to know enough to judge for itself, a Board is in order.

Professor George F. Barker, of the University of Pennsylvania (if the newspaper accounts are correct, and I suppose they are) is the head of the board. In a lecture delivered in Philadelphia last evening the Professor made some erroneous statements. He said: "I know all other generators, and Edison's is best of all." To this I would reply that Mr. Edison's generator is inferior to several others, in practical use to-day.

Professor Barker said: "Ninety-eight per cent. of the energy was secured by his (Edison's) new generator." I positively assert that Mr. Edison's generator does not develop 45 per cent. in electricity of the power applied to it.

Professor Barker is reported to have tied a knot in a bundle of carbonized manilla horse-shoes. This is physically impossible. The Professor may have taken horse-shoes charred only upon the surface and tied a knot with them, but not with carbonized manilla or any other material. Carbon, however flammable, is as brittle as glass.

Professor Barker said that with the Edison lamp, "ten lights of 16 candle power are produced for each horse power." I assert that Mr. Edison cannot obtain more than two lights of 16-candle power each per horse power. Mr. Edison does not get more than 24 candle light per horse power—not 160, as Professor Barker asserts. Mr. Edison has not yet learned that the greater the resistance of a lamp the greater the power required to operate it.

Possibly Professor Barker is mistaken in his calculations, and may in future correct them. If so, his real friends will be pleased. If not, he must expect criticism; and I am prepared to meet any allegation the moment it is refuted by figures.

Respectfully,

W. E. SAWYER.

New York, March 25, 1890.

[*New York Tribune, April 10, 1890.*]

**Efficiency of Edison's Machines. A Report by two College Professors on this Subject.**

Mr. Edison recently invited Professors George F. Barker, of the University of Pennsylvania, and Professor H. A. Rowland, of the Johns Hopkins University, to test the efficiency of his dynamo-magnetic machines

at Menlo Park. The purpose was to ascertain the amount of light generated by one horse-power of the steam engine. This is an important point in regard to electric lighting of houses, because the question of its economy is to be decided thereby.

The two professors made an examination at Menlo Park about the middle of the month of March. A paper containing the results they arrived at will appear in the April number of "The American Journal of Science and Art." Advance sheets thereof have been sent to "The Tribune."

The test of efficiency was made by immersing a lamp in water and observing the total amount of heat imparted to the water per minute. A second lamp was at the same time placed in the photometer so as to obtain a record of its brilliancy. Then the two lamps were made to change places, and the results newly obtained were recorded. The mean of the two sets of results was taken as the true efficiency. Three lamps were employed, two having paper carbon burners, and one having a burner of carbonized manilla fibre. This test was based on the well-known scientific law that a rise of temperature of 1° in one pound of water per minute indicates an expenditure of 772 foot-pounds or 1.45 of one horse-power. It was the only test made.

Professors Barker and Rowland found that the paper carbons gave out only one-third as much light in the flame of the edge as in a direction perpendicular to the surface. In stating the light obtained therefrom an average was taken.

The following table shows the results obtained by Professors Rowland and Barker:

No. of lamp.	Light obtained in candle.	Energy developed in foot-pounds.	Total number of abs. light obtained.	No. of lights per actual horse-power.
501.....	15.1	5,280	6.8	4.8
502.....	10.1	3,540		
503.....	11.1	3,700		
504.....	32.5	4,200	12.8	8.0
505.....	14.5	5,000		
506.....	9.5	3,320	8.3	5.8
517.....	17.2	5,700	13.1	9.2

The last column is obtained by deducting 50 per cent. for loss of power by friction in the engine and machinery and resistance in the conducting wires.

Professors Howland and Barker conclude as follows:

The increased efficiency with rise of temperature is clearly shown by the table, and there is no reason, provided the carbon can be made to stand, why the number of candles per horse-power might not be greatly increased, seeing that the amount which can be obtained from the arc is from 1,000 to 5,000 candles per horse-power. Provided the lamp can be made either cheap enough or durable enough, there is no reasonable doubt of the practical success of the light, but this point will require much further experiment before the light can be pronounced profitable.

The paper states that the test of efficiency of the Edison machines was entered upon because of the popular interest in the subject, and because accounts of this light have thus far been given to the public chiefly by papers and magazines, "and newspaper science has justly a very unenviable reputation for accuracy."

[*Telegraphic Journal*, April 15, 1880.]

#### The New Sawyer Electric Lamp.

"This lamp," says the "Scientific American," "based upon the incandescence of a pencil of carbon immersed in nitrogen gas, is in no way different in principle from the Baudouin or the old Sawyer-Mann lamp exhibited some years ago. The pencil is contained within a globe two inches in diameter and ten inches high, sealed at the bottom by means of a cement, which, while adhering perfectly to the glass and metal, is sufficiently elastic to compensate for the unequal expansion of the two. It suffers only at a temperature of 800° Fah. The globes are charged by the process invented some time ago by Thomas B. Stillman, which is so simple in its details and so rapidly operated that a single workman can prepare fifty lamps per hour at a cost of about thirty cents, in such a manner that according to Stillman's calculation, the amount of atmospheric air remaining is only an infinitely small fraction of the normal quantity. The cost of the nitrogen is stated at eight-tenths of one cent, and that of its purification as one and one-fifth cents; the total cost of recharging a lamp, when the nitrogen is exhausted or becomes mixed with air, being, inclusive of the wages of the workman, two and three-fifths cents, against a cost of seventy cents for the process usually employed. The carbon pencil, seven inches in length and about three thirty-seconds of an inch in diameter, is fed upward as fast as disintegration takes place at the point of contact, by

means of a regulator, which will be substituted by an automatic feeder as soon as the arrangement can be perfected. Mr. Sawyer says that one of these pencils, used for five hours a day, will last at a minimum calculation from his experiments, not less than sixty days, and, at a maximum, for two years. The cost of the pencil is a trifle less than two cents, and the cost of replacing and recharging with nitrogen nine and three-fifths cents. The lag of sodium and the large spiral conductors at the base of the carbon, which were distinguishing features of the Sawyer-Mann lamp exhibited about a year ago at No. 40 Wall Street, have been discarded. Two small steel rods take the place of the latter. The globe, which is not unlike the chimney of an ordinary kerosene lamp in general appearance, is inclosed in a nickel-plated hose, which may be highly ornamented or not, according to the taste or means of the user. Photometric tests, it is said, have been made with a Suggs photometer, such as is used by the gas companies for the same purpose, and each light was registered as equal to twenty-seven and five-eighths standard candles, or a little more than twice the value of a five-foot gas burner, which usually registers from ten to twelve standard candles. Mr. Sawyer claims that his system of distribution is entirely novel and original, but declines for the present to give a description of it, his private not having been as yet secured. The regulator, we are told, is based upon the glass men, by the old Berlin house of Siemens Brothers, by which only such a volume of current is supplied as is necessary to overcome the resistance. The light is readily turned down to a glimmer by turning a button in the wall. In its optical properties this light is much like gas. It is yellow, steady, and soft, and consequently not irritating to the eye. It has none of the blue rays incident to the voltaic arc arrangement, and the shadow cast by intervening objects is softened and subordinated to the margin. For practical purposes it is believed that the power of each lamp shall not exceed that of two ordinary gas jets."

[It is stated that seven lamps are operated upon one circuit worked by four horse-power. The economy of this system does not appear to be marvellously great. Seven lamps of 27½ standard candles each, or 192½ candles in all, for four horse-power, is not a very wonderful achievement.]

—Ed. Tel. Jour.]

[From the New York Herald, August 13, 1889.]

**Edison's Light and Locomotive. Professor Sawyer gives a Free Expression of Opinion on the Matter, and Proposes some Scientific Considerations.**

New York, August 10, 1889.

To the Editor of the Herald:

I send your article in this morning's "Herald" explaining why Professor Edison has made haste so joyfully with his 500 Inventions, and have also remarked other statements from Menlo Park concerning the same. Whatever criticism may be passed upon what I have said, or may say, or the motive therefor, my purpose has been, and is, solely to correct any public misapprehension regarding this subject, for there is nothing to-day made so deceptive as this very subject of electricity, and I cannot appreciate the design of any one in exaggerating its importance or the results obtained, or to be obtained from it. There is no more reason why it should be misinterpreted than there is for the misinterpretation of any other force. It is no mystery, except as all other forces are mysterious. It is as easily weighed, and, so to speak, divided as any other force. The attempt to represent it as a force more subtle and incomprehensible than others is a mistake. The transmission of light and heat, the force of attraction which holds the world in its track at a distance of 85,000,000 miles from the sun, the attraction of cohesion of particles, whereby all matter is made manifest, etc.—these mysterious entities no more than the minds of many who make electricity to the dignity of exceptional sanctity. All other forces are equally subtle, as any one will find who essays their explanation. The supposition to be most commonly understood of all sciences—that of steam engineering—has, after a century of the work of the best genius and the expenditure of untold wealth, resulted in what?—in the recovery from a pound of coal ten per cent. of the energy stored up in it. Yet an electrical generator is said to be fashioned in an hour that yields 90 to 100 per cent. of the power supplied to it, and the electricity thus generated is as readily reconverted into power as an equally high percentage. Men who do not know an ohm from a microfarad make an experiment and settle the whole question by their certificate, with about the same certainty as a physician would make a sale of clothes or a tailor treat his patient. Is it not about time that this sort of business should cease? or, at least, that those really familiar with the subject should tell the truth about it? When electricity shall be more generally understood, those who lend their names to any deception will be most thoroughly understood. There is one thing that never succeeded like success, and that is

successful deception. I do not mean to charge that there is any deception at Menlo Park. That would certainly be unwise. But what I do wish to state, and am prepared to substantiate, is included in the following:

Professor Edison claims that he can supply his electric lamps at thirty-five cents apiece. Perhaps this is so; undoubtedly Professor Edison is able to give them away. But, nevertheless, his lamps to-day cost him ten times that amount, and when it was announced (without authority, of course), that their cost was twenty-five cents apiece, it was really not less than 65 or 66 for each and every working lamp. It is stated that the average power of the Edison lamp is fifteen and a half candles, and certain professional gentlemen have ascertained ten separate lamps per horsepower, each of a power of twelve candles, or an average is divided light of 120 candles per horse power. This is a serious error, on account of which the aforesaid professional gentlemen are entitled to our profoundest sympathies. If one of them were to tell a steamboat that it is so cheap to run a boat ten miles an hour as five he would be laughed at; but these great intellects experience no misgivings whatever in informing the public that it takes as little power to overcome an electrical resistance of 150 ohms (as in Professor Edison's lamp) as it does to overcome a resistance of one or one-half or one-quarter ohm. What renders the voltage are lamp and generator of one electrician more power (and therefore cheaper, since the expenditure of steam power is the same in both cases) than the lamp and generator of another? It is the low resistance of his arc and generator. Why is a Daxton or a Herchhausen or a Siemens are more powerful with the same expenditure of steam power than that of others? Because their arcs are, so to speak, "short and thick," of great quantity and low tension, while the failures are found in lamps of high resistance, and high tension is necessary to overcome high resistance. Electricity operates very peculiarly. If fifteen-dixths of a given current produces ten candle power the whole current (sixteen-dixths) produces more than twenty candles. To make an economical light, it is necessary, therefore, that the carbon shall be able to stand the final fraction of current. The first fractions produce but little light. To operate forty of the Edison lamps on the steamer Columbia required thirty horse power, and the average light per lamp was less than six candles. Professor Edison proposes to use ground glass globes, because it is said that he has discovered that it is unwise that ground glass globes involve a loss of thirty per cent. in the light emitted. It is well

known that ordinary clear glass globes occasion a loss of about twelve and a half per cent. It certainly will not be argued that a luminous point within a ground glass globe will yield as much light as in a clear crystal globe, and as Professor Edison only claims fifteen and a half candles, there can be no trifling reason for reducing this light by obscuring it. The true reason is that the carbon horseshoe by its rapid disintegration so discolors a clear globe as to make such a globe objectionable. Hence, and very wisely too, Professor Edison intends to use opalescent globes, preferably outside the other globes, because the outside opalescent globes especially do not discolor. But the loss in light is nevertheless very marked and very disadvantageous in point of economy. Professor Edison places the cost of the plant for 800 of his lamps at that of an engine of 100 horse-power and a dynamo machine absorbing that power. Owing to the high internal resistance of his lamps and the incapability of the horseshoe fibre to stand powerful currents, Professor Edison has never been able to operate more than two of his lamps at twelve candle power each per horse-power, and it is said that he cannot so operate them to-day, and he is asserted to be unwilling to submit the same to a test before competent engineers. Professor Edison claims a life of six months' ordinary use for each of his lamps run at a power of fifteen and a half candles. This is so great an error in calculation that his present lamps, provided with enlarged carbons, will not run a week at that power, and his former lamps more than three hours without disruption of the fibre. The assertion that out of the profits derivable during the day from the supplying of electric power as against steam power, Professor Edison can afford to operate his electric light at night at a merely nominal price is so utterly absurd as to be unworthy of consideration; so also is the statement that as much electric power can be utilized out of 300 pounds of coal as steam power out of 700 pounds. That steam power from 300 pounds of coal can be made to operate an electric generator, which in turn shall operate an electric engine, each conversion of power being necessarily attended with loss, and that this electric power shall be as cheap as the direct steam power from two and one-third times that amount of coal, ought to be a proposition sufficiently striking to impress the mind of the most casual observer. On the contrary, the cost of electric power generated by steam engines and dynamo machines will be at least four times the cost of the original steam power. The statement made is far worse than that made a few years ago with regard to a Gramme electric machine, which was driven by a steam engine and the current from which was used to drive a second Gramme machine which was the counterpart of the first. It was

said that seventy-five per cent. of the power of the steam engine was developed in the second dynamo machine, although (not to speak of the loss of power in the first conversion into electricity) the internal resistance of both machines was the same, and the current being necessarily divided equally between the two, the second machine, as it thus obtained only one-half of the current, could by no possibility have been able to convert into power, even if a perfect machine, more than fifty per cent. of the electricity generated in the first machine. The new Edison electric locomotive is said to go around extraordinary curves at the rate of forty miles per hour, and it is remarked that although the track is only about half a mile long this speed is almost instantly attained. This must be news to railroad men. There is no magnetic traction between the vehicle and the rails, and yet, although the engine is very light, it is said to exert upon the rails a most extraordinary traction, enabling it to draw proportionately heavy loads up unusual grades. Perhaps this will be news to the coal carriers. I can imagine how anxious the Pennsylvania roads will be to try this new motor first where it will have the heaviest work to do—on freight trains. There are some other points of interest to electricians, but as the world is likely to go round as usual for some time to come, it would appear to the casual observer that the foregoing might be sufficient for the time being.

All of which is respectfully submitted.

W. E. SAWYER.

[New York Evening Express, November 26, 1889.]

**Electric Light, Sawyer on Edison and Maxin. Is the Maxin Lamp Plagiarized from Edison? Queer Operations of Electricians. A Spicy Interview with Professor Sawyer.**

The following memorandum was left at the "Express" office on Tuesday evening:

"The so-called Maxin system of incandescent lighting, on exhibition at the Equitable Building, is a direct appropriation of the Edison and Sawyer inventions. If a reporter will call on Professor Sawyer, at his residence, No. 200 West Forty-second street, he will be furnished with full particulars."

In reply to the above a reporter of "The Express" called upon the electrician this morning, and found his attention about evenly divided

between his breakfast, the morning papers and two rosy children. On learning the object of the visit, however, he immediately left the breakfast-table and prepared to be interviewed. "That correctly expresses the condition of affairs," he said, upon being handed the above memorandum. "I know Mr. Maxin very well, and while he is beyond doubt one of the best mechanical engineers in this country, I have no hesitation in saying that in his last attempt at electric lighting he has made a wholesale appropriation of other people's property. Edison's statement to the same effect has already been published."

"But how can he do that?" asked the reporter. "Endly enough. There is no law to prevent any man making, exhibiting, and experimenting with the inventions of others. A dozen men may go to work and do the same thing that Maxin has done. When it comes to doing business and making money out of other's property, then, and then only, can the infragenerators have be invoked."

"How long have you known Mr. Maxin?" "For several years. In 1877 I was associated with a Mr. Schuyler, and Maxin was employed to reduce my work to practical mechanical shape. I did not like Maxin and was distrustful of him. Several times he had the effrontery to claim to others before my face ideas given him by me. Finally I was given the option of taking Mr. Maxin in as a joint inventor and sharing equally with him, or a discontinuance of my work. I decided upon the discontinuance plan, and have had nothing to do with Maxin since."

"Is this Mr. Schuyler now associated with Maxin?" "I believe so, but as I have no controversy with him so long as he keeps out of my way I do not care to discuss that relation. At some future time I may have a good deal to say on the subject, but not now."

"I see that Professor Morton and Professor Barker both speak in terms of praise of the Maxin light." "Yes; I have read all they have had to say, and it amounts to very little." After all the effronteries about Edison, Professor Barker's running round to Maxin and against Edison puts him in a very bad light. His statement that he ran one of the Maxin lamps twenty-four hours at an intensity of six hundred and fifty candles is wholly untrue. The highest point at which Maxin ever ran a light was less than sixty candles, and he told Mr. Hopkins, of the "Scientific American," that it would not stand running at that intensity. Look at the lights in the Lydiate. In one small room, and giving a moderate illumination, there are thirteen of them, only one of which gives a fair light, and that not in excess of eight candles. The eight brighter lamps do not average two candles each. In the vaults they are run a little better. Why is this? Because it is easy to replace the lamps in the vaults without attracting attention, and this cannot be done in the reading-room. The

intensity of light in the reading-room lamps is, therefore, the maximum intensity at which it is considered safe to run them."

"Do you know how many lamps there are in operation?" "There were sixty-one the last time I had the matter investigated, and those sixty-one lamps, averaging in power less than eight candles each, consumed twenty-seven power. One Sawyer lamp will give more light than the entire thirteen lamps in the reading-room with less than half a horse-power, whereas the thirteen Maxin lamps consume four-and-a-half power. You may put that down for a fact."

The electrician here took a short-hand note-book from a secretary. "This will be interesting some time," he remarked. "Since early in the past summer Maxin has been running to me. Every week, and sometimes every day for a week, he has been at my shop more, by invitation, I stopped at his factory on my way home, for a few minutes. He wanted to make capital out of some incandescent lamp, and was at his wife's end to do nothing. Generally, at his desire, we were alone. I was unable until last Sunday to secure a witness to our interview, and these stereographic notes are the result," observed the electrician, smilingly. "You see, Maxin on leaving me Friday last, appointed to call at my laboratory again Saturday. Saturday he did not come until I was on my way out, and he then appointed Sunday at my residence. I kept two witnesses awaiting his coming all day in an adjoining room. Finally, about three o'clock he came, and remained until seven o'clock."

"What occurred, Professor?" "A great deal. Maxin virtually acknowledged that he was infringing Edison's incandescent lamp patent; that in his distributing system he was infringing the Sawyer-Mas distribut- ing system, and that in forming his carbon loop by submitting it, when heated to incandescence by the current, to a stream of hydro-carbon vapor, he was infringing the Sawyer-Mas patent for that process. You will see that Professors Morton and Barker unite in crediting Maxin with this discovery, but this is probably because they have been misinformed. However, that can do no harm. Another thing that these gentlemen unite on is in declaring the hydro-carbon atmosphere in Maxin's lamp new. Of the contrary, it is very old. Not so hydro-carbon atmosphere is employed in the lamp. I told Mr. Maxin that there was nothing in his system of lighting, and that he did not make his carbon self-renewing by keeping them supplied with hydro-carbon, and he did not deny the same. His carbon is no better preserved in a hydro-carbon vacuum than in the Edison vacuum. What Maxin does is fill his globe with gasoline vapor and then exhaust. There is only a trace of gas left, and this is soon decomposed, the carbon being deposited on the loop and the inner surface of the globe, and the hydrogen is set free. Thus his lamp almost immed-



ately becomes one sealed in a hydrogen vacuum; and if Edison will fill his globe with hydrogen and then exhaust, he will have identically the same conditions as Maxin has in his hydro-carbon vacuum. The ideas given out by Professor Barker and others are the more surprising when it is considered that such men should have a sufficient knowledge of chemistry to be able to detect the flaws in the Maxin process as stated by its projectors. The self-renewal of the carbons chimed in a fragment of the imagination; and I have made so many and so extensive experiments in incandescent lighting, that, in order to make a claim at its true value, all that is necessary is to have it unequivocally stated."

"Then you do not consider that Maxin has discovered anything new?" "I have seen Edison's patent and Maxin's patent. The devices for horizontal swirling of the globe described in Maxin's patent are not used by him, but all the devices shown in Edison's patent are used by Maxin. Maxin is a great adapter, and changing the horseshoe into a double loop to form a letter M is characteristic of the man. But a few years hence he will not be heard of in electric lighting, except as putting his name to the work of others, while I have some confidence that Edison will. Edison's improved generator. I am informed and believe, is a very successful one, and there is altogether too much enmity against him on account of his delays. I have never fancied Edison, but there is one thing that ought to be said about him in this matter of electric lighting: Whatever questions of priority of invention may arise, I am satisfied that Edison has never shown a light or any connected appliance that did not originate in his own mind as well; and I have some respect for a man that travels on his own merits. If I were in Edison's place, I would put into my lamps carbons of lower resistance, and run them at a higher temperature, for there is where the economy is, and I would not make an exhibition until good and ready. If people will let him alone Edison will do a great deal better than he has done."

"What is Maxin's regulator?" "I have not seen it, and as its chief advantage seems to be to render the Equitable lights unsteady, I don't want to; but when I was at the Franklin Institute in Philadelphia two weeks ago, Professor Thompson, who, with Professor Houston, holds the patent for the regulator, told me that they were about to institute proceedings against Maxin for using it."

"Did Maxin say to you in so many words that he was infringing all these patents?" "That could hardly have been expected. He stated that he was using these devices, and the sole purpose of all his meetings with me has been to arrange some plan to enable him to commercially use

them. To show you, I will read an extract from these stenographic notes referring to the hydro-carbon process used by him: "Maxin—Well, Sawyer, I don't see that we are getting any nearer to a settlement. I must give my company something that will satisfy them. Suppose we divide it in this way—you give me the right to use the carbon process in treating our lamps, and you have the exclusive right to treat pencils of carbon not less than one-twentieth of an inch in diameter." You can see from that the drift of the interview."

"Did you intend to make any combination with Maxin?" "Not while I am rational. I merely desired to prolong the interview in order that he might so consult himself in the hearing of reliable witnesses, that when I should come to make a statement it would be fully for him to deny it. His purpose was to use me, and I therefore considered it legitimate to use him. He has sought me out all the time and every time."

The electrician reflected for a moment and continued: "Maxin is about as shrewd a man as they make nowadays. One of his moves was to associate with him Professor Farmer, who has note-books. You don't know the meaning of that so well as they know it in the Patent Office. Well, as Maxin occurs to him, say that the light of an electric lamp might be regulated, and he puts it down almost as follows, with the date: 'Regulate the light by giving it more or less current.' That stands for years until somebody else devises an apparatus for doing the thing; then Farmer produces his note-book and gets into interference in the Patent Office, where, however, he generally suffers defeat. Knowing this discrepancy when I had perfected the Sawyer-Max lamp, I entered into correspondence with the Professor to get his advice, and in the course of it he wrote full details of all his work in the same direction. Then I put his letter in a safe place and copied my patent, so that hereafter I have not been troubled by that note-book."

With this full expression, Professor Sawyer returned to his breakfast, the morning papers and the two rag children, and the "Express" reporter withdrew.

"NOTE.—Having now furnished data showing Sawyer's limited knowledge of the art of electric incandescent lighting in its early stages of development, we do not deem it necessary to refer to this subject again in future bulletins to agents."

EDWARD H. JOHNSON,  
President.

**Edison Electric Illuminating Company of Boston Records [Not filmed]**

These records cover the years 1885-1889. They consist primarily of the correspondence files of the Edison Electric Illuminating Company of Boston during the earliest years of its existence. Included is material relating to the establishment and operation of the company and the construction of the first Boston central station. At the core of the collection are the letters exchanged between company treasurer F.S. Hastings in New York and superintendent A.T. Moore, Jr. in Boston, along with the letters between Hastings and Moore's successor, William J. Hammer. Other major correspondents include officers and directors Hubbard Breed, Charles H. Coster, William W. Gooch, Edward H. Johnson, and Sidney B. Paine; and W. J. Paine of the New England Wiring Company.

A microfilm copy of these records was recently prepared by the Edison National Historic Site. For this reason, they are not included in Thomas A. Edison Papers Microfilm Edition, Part II. An archival finding aid to the records appears on the following three frames.



IN REPLY REFER TO:

## United States Department of the Interior

### NATIONAL PARK SERVICE

Edison National Historic Site  
Main Street and Lakeside Avenue  
West Orange, New Jersey 07082

#### EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON

Papers, 1885 - (1886) - 1889, 1986.

2 boxes (.75 ln. ft., ca. 1000 items)

Gift of Boston Edison, 1986

[Microfilm copy in process, 8/1986]

Accession 511

Stored: Vault 12-2

**Scope and Contents:** Incoming correspondence and copies of outgoing correspondence of the Edison Electric Illuminating Company of Boston during the earliest years of its existence. The correspondence records some of the events leading up to incorporation; matters having to do with the establishment of the first central station in Boston, including financing, real estate and construction; the subscription and connection of new customers to the system; and the full range of administrative, personnel and financial aspects of the creation of the new company. At the core of the collection are the letters between company treasurer F.S. Hastings in New York and Superintendent A. T. Moore, Jr., in Boston, and later Manager William J. Hammer, Moore's successor. These letters provide a detailed chronicle of daily operations and provide such specific information as data on the costs of individual customer installations and use of service. Among the other major correspondents are Hubbard Breed, Charles H. Coster, William W. Gooch, Edward H. Johnson, Sidney B. Paine and W. J. Paine of the New England Wiring Company.

Material relating to the company's centennial, specifically a corporate history, brochures and a calendar, were presented along with the collection. A number of photographs owned by Boston Edison are reproduced in the centennial brochure and calendar.

**History.** The Edison Electric Illuminating Company of Boston was officially formed in January, 1886, organized with capital from the Edison Electric Light Company, the Edison Company for Isolated Lighting, and J. Pierpont Morgan. Starting with the Bijou Theatre, the company began serving customers in February 1886. During the company's first year of operation, its president, Edward H. Johnson, and other key directors and officers of the firm, such as F. S. Hastings, Charles H. Coster and Charles Batchelor, were headquartered in New York. Some of the other directors and managers, such as Hubbard Breed, A. T. Moore, Jr. and William J. Hammer, were located in Boston. Management of the company increasingly shifted to Boston in the years following 1886. In 1890, the company took over the territory of the Back Bay Incandescent Company, and in 1901 merged with the Boston Electric Light Company. The corporate name was changed to Boston Edison Company in 1937.

The company is known for its innovations, including the use, in the early 1890s, of the first direct-connected vertical engines at a central station. Also in the 1890s, the company founded the first practical electric storage battery facility. By the early 1900s, Boston was the best lit city per capita in the United States, and the first large American city to be served by a single utility.

For a complete history of the company, see David B. Sicilia's corporate history, contained in Box 2.

**Finding Aid:** Container and folder list.

#### **Added Entries**

Back Bay Incandescent Company  
Boston Edison Company  
Boston Electric Light Company  
Edison Electric Light Company  
Edison Company for Isolated Lighting  
New England Wiring Company  
Winthrop Group, Inc. (Cambridge, Mass.)

#### **Electric light and power**

Breed, Hubbard  
Coster, Charles H.  
Edgar, Charles Leavitt  
Gooch, William W.  
Hammer, William J.  
Hastings, F.S.  
Johnson, Edward H.  
Moore, A.T., Jr.  
Palne, Sidney B.  
Sicilia, David B.

EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON

Papers, 1885-1889, 1986

Container and Folder List

Incoming Correspondence, 1885-1889. Contains one disbound letterbook mainly of letters to F.S. Hastings, with numbered and unnumbered pages, in chronological order (page numbering is erratic). Also contains one file relating to the replacement of William J. Hammer as manager by Charles Leavitt Edgar.

Box 1      Folder:

Letterbook, December 1885 - June 1886

Letterbook, July 1886 - August 1886

Letterbook, September 1886 - December 1886

Correspondence relating to the replacement of William J. Hammer as manager by Charles Leavitt Edgar, August 1887 to July 1889. Includes typed transcription.

Outgoing Correspondence, 1886. Contains one disbound letterbook primarily of letters from F.S. Hastings, with numbered and unnumbered pages, in numerical order (close to exact chronological order).

Box 2      Folder:

Letterbook, Pages 1-115 (February - May 1886)

Letterbook, Pages 116-261 (June - July 1886)

Letterbook, Pages 262-490 and unnumbered (September - December 1886)

Letterbook - Binding

Related Material, 1986.

Box 2      Folder:

Centennial history and brochure prepared by David B. Sicilia of the Winthrop Group, Inc. (Cambridge, Mass.) 1986; Boston Edison Centennial Calendar, 1886.

#### Thomas A. Edison Construction Department Records

These records, which cover the period 1882-1884, were generated or used by the Thomas A. Edison Construction Department. Edison founded this company in 1883 for the purpose of constructing direct-current electric power stations in towns and cities throughout the United States. This was the only electric light company that Edison managed directly. It operated from May 1883 until August 1884, building thirteen central stations in Massachusetts, New York, Ohio and Pennsylvania. In September 1884 the Construction Department merged with the Edison Company for Isolated Lighting, which assumed responsibility for the construction of all central stations in the United States.

##### The following items have been filmed:

1. Questions for Central Station Engineers (1883)
2. Central Station Engineering Plans (ca. 1883-1884)
3. Canvass Book (ca. 1882-1883)
4. Record Book (1883-1884)

##### The following items have not been filmed:

1. Mapping Department Books (1883-1884)
2. Gas Statistics Book (ca. 1881-1882)
3. Meter Book (ca. 1883-1884)
4. Samuel Insull Pocket Notebook [PN-84-01-04] (1884)

### Questions for Central Station Engineers

This 45-page typescript contains copies of a series of questions, prepared by Edison in 1883, relating to central station system technology. Separate sets of questions were devised for meters, for dynamos, and for engines and boilers. H. Ward Leonard, who helped establish meter departments at several central stations, supplied answers to "Questions Relating to Meter Department." William S. Andrews, chief electrical engineer for the central stations, supplied answers to questions about the running of dynamos. W. D. Rich, superintendent of construction for the central stations, supplied answers to questions about the running of engines and boilers.

Two question books containing answers by H. M. Doubleday and corrections by Edison have not been filmed. The books are labeled "Meters" and "Running of Dynamos." The date November 21, 1883 also appears on the front cover of each book. Manuscript copies of some of the questions and answers can be found in D-83-043 (Document File Series).

Instructions at the end of this book  
were written by Mr. Edison.

All questions in this book were form-  
ulated by Mr. Edison.

Answers to motor questions were  
written by H. Ward Leonard.

Answers to questions on dynamos were  
given by W. S. Andrews.

Questions on steam engines and boil-  
ers were answered by ?



# QUESTIONS RELATING TO METER DEPARTMENT.

By H. Ward Leonard.

- Q. 1 - Why is German silver used for a shunt in meters, in preference to other metals?
- A. 1 - Because its electrical resistance changes much less than other metallic resistances through great ranges of temperature.
- Q. 2 - By what per centage does the resistance of German silver increase with every degree or 100 degrees of rise of temperature?
- A. 2 - Its resistance increases .00019, or about .02 of one per cent. for each degree of rise in temperature.
- Q. 3 - That is the resistance of the shunts of 6 light, 12, 25, 50 and 100 light meters?
- A. 3 -
- |                |         |
|----------------|---------|
| 6 Light Shunt. | .04 ohm |
| 12 "           | .02 "   |
| 25 "           | .01 "   |
| 50 "           | .005 "  |
| 100 "          | .0025 " |
- Q. 4 - How is the resistance of the shunts obtained?
- A. 4 - The strip of German silver is placed in series with a standard resistance in the circuit of a good battery of constant E. M. F. The strip is held fast by clamps, which carry the circuit wires and also wires leading to a galvanometer. Take a deflection around the standard and then around the strip, adjusting its length by varying the distance of the clamps, until the deflection is the same as the standard strip. Its resistance will then be the same.
- Q. 5 - Supposing that on the 1st of January, in a certain place, the temperature was 2 degrees below zero, Fahr., and in the same place, on the 1st of July, the temperature of the air was 100, what would the resistance of the shunt be at 2 degrees below zero, and also at 100 Fahr.
- A. 5 - The resistance of 25 light shunt at 2 Fahr. 0.0098486 at 100 degrees Fahr. 0.0100996.

Clarke, in answer to the 5th question on meters, states that persons would be apt to obtain slightly different results according to their authority on the change of German silver in resistance by temperature.

In round numbers the change is 0.025 per cent. per degree Fahr. The most exact method of determining the resistance will be by a formula given by Dr. Matthiessen, in "Reports of Electrical Standards," page 227. The formula is:-

$$R = r (1 + 0.0004433 t + 0.000000152 t^2)$$

Where R is the resistance at temp. t cent. when r is the resistance at zero.

Your question calls for the resistance at - 2° F. and + 100° F. or at - 18.89 cent. and + 37.78 cent. A 25 light shunt correctly adjusted should measure 0.01 ohm. at 60° F., or 15.56 cent. Assuming the resistance at zero cent. to be unity, the formula gives the following results:-

Temperature	Ratio of Resistances	Actual Resistance of Shunt
- 2° F. or - 18.89° C.	0.99168	0.0098486 ohm.
50 F. or 15.56° C.	1.00493	0.0100000 "
100 F. or 37.78° C.	1.01696	0.0100996 "

- Q. 6 - If 100 lamp hours were recorded during a month when the temperature of the air was constantly 62 Fahr., what would be the percentage of error from this record if the same lamp hours were recorded at 2 degrees below zero and also at 100 Fahr.?
- A. 6 - The meter would freeze at 2 degrees below zero; at 40 Fahr. it would be 1.707 per cent. low; at 100 degrees Fahr. .033 per cent low. The standard solution freezes at 2.5 to 3 degrees centigrade.

Clarke, in answer to question 6, experiments on August 15, 1882, on the temperature at which the standard solution freezes, determined it between - 2.50 and - 3° cent., and a rise in temperature at the moment of solidification of about 1.5° to 2° cent. This makes the freezing but a few degrees below that of water, consequently the answer to your question of the error at - 2° Fahr. is that the solution would be frozen and the action of meter would cease.

Another answer is the following:- Assuming the thermostatic regulator to be in adjustment, it should maintain the temperature of the solution at 40° F. (4.44° C.) At this temperature the resistance of the meter bottle circuit is 9.82 ohms. The resistance of the shunt will be (4.44° C.) (Matthiessen's formula) 0.0099508 ohms. Of the total current

$$\frac{99508}{98200000 + 99508} = \frac{99508}{98299508} \text{ th}$$

part will flow through the meter bottle.

At 100° F. (37.78° C.) the resistance of meter bottle circuit will be 9.8 ohms., and resistance of shunt 0.0100996 ohms., of the total current

$$\frac{100996}{98000000 + 100996} = \frac{100996}{98100996} \text{ th}$$

part will flow through the meter bottle.

At 62° F. (16.67° C.) the resistance of meter bottle circuit will be 9.705 ohms., and resistance of shunt 0.010005 ohms., of the total current

$$\frac{10005}{970500 + 10005} = \frac{10005}{9715005} \text{ passes through}$$

the meter bottle.

To recapitulate:-

Temperature Fahr.	Ratio of Current through Meter Bottle
40° F.	$\frac{99508}{98299508}$
62° F.	$\frac{10005}{9715005}$
100° F.	$\frac{100996}{98100996}$

Taking the current at 62° F. as the unit of comparison, or 100 per cent., we have:-

40° F. 98.232  
62° F. 100.000  
100° F. 99.967

Therefore the record at 40° F. is 1.707 per cent. lower, and at 100° F. is .033 per cent. lower than at 62° F.

These notes are all on the 25 light meter, but the per cent. of error will be the same for all sizes.

- Q. 7 - Which increases its resistance the most by a rise of temperature, German silver or the solution of sulphate of zinc?  
A. 7 - German silver.

- Q. 8 - What is the effect of a rise or fall of temperature on the resistance of the sulphate of zinc solution?  
A. 8 - A rise of temperature causes a diminution of resistance.

- Q. 9 - What is the average resistance of a bottle in a 25 light meter, also in 6, 12, 50 and 100 light?

A. 9 -  
6 light bottle = 6.92 ohms.  
12 " = 3.46 "  
25 " = 1.73 "  
50 " = 0.865 "  
100 " = 0.4375 "  
(Conant's answer.)

Clarke says the 9th question is an unsatisfactory one. The resistance for a 25 light meter bottle at 40° .28 Fahr. is 2.214 ohms., and at 116° .52 Fahr. 0.941 ohms. These are the limits of the experiment.

The average resistance for the ordinary ranges of temperature to which the meter will be exposed (40° F. to 80° F.) will be given by the resistance at 60° F., equal to 1.71 ohms.

For all meter bottles, therefore, we have -

Capacity	Resis. at 60° F. (Average)
6 Lights;	6.94 ohms.
12 "	3.42 "
25 "	1.71 "
50 "	0.865 "
100 "	0.4275 "

- Q. 10 - What is the object of the coil of copper wire placed in the same circuit as the bottle?

- A. 10 - To balance the variations in the resistance of the sulphate of zinc solution, due to a rise or fall of temperature in the room, and thus maintain the ratio between the resistance of the bottle and the shunt, constant at all usual temperatures. The copper increasing resistance as the sulphate solution decreases.

- Q. 11 - What is the per centage of increase of resistance of copper by heat?

Clarke says: For ordinary meter temperature, 40° Fahr. and 80° Fahr.; we have, at 40° Fahr., a resistance one mil-foot copper, 9.92728 ohms; at 80° Fahr., 10.74274 ohms; hence, per cent. of increase for 40° Fahr. is 8.2144, or 0.205 of one per cent. per degree.

- Q. 12 - What is the object of always employing a solution of the same specific gravity?
- A. 12 - To be able always to obtain results under the same conditions, that is to say, have the same constant for oxidation, the same resistance, the same ratio between loss and deposit.
- Q. 13 - What is the effect of impurities in the sulphate of zinc solution; iron, for instance?
- A. 13 - The most troublesome effects are the reduction of the iron salts by the zinc of the plate, causing uncertainty in the monthly reading. If present in large quantity, the resulting mud may cause a cross between the plates, making variations in the resistance of the bottle. (Conant.) It causes local electrical action and consequent error, very great in some cases.
- Q. 14 - What is the most frequent impurity in sulphate of zinc?
- A. 14 - Iron salts.
- Q. 15 - Is it essential to have very pure sulphate of zinc, or will the ordinary sulphate of zinc answer.
- A. 15 - The sulphate of zinc should be free from metallic and organic impurities.
- Q. 16 - What is the object of the mercury on the electrodes or plates?
- A. 16 - It prevents local electrical action between the particles of metal and the zinc, both in the zinc, it being impracticable to get pure zinc. It also reduces the surface of both zincs to exactly the same condition, hence prevents polarization.
- Q. 17 - What produces the white deposit one sees at the bottom of a meter bottle, and what is this deposit?
- A. 17 - Conant says oxide of zinc; Brower says insoluble sulphate of zinc. It is probably oxide of zinc formed by local electrical action between the zinc and mercury or metallic particles.
- Q. 18 - What is the effect of putting more lights through a meter than it is intended for?
- A. 18 - The primary effect would be to cause too heavy a deposit, and make the solution very muddy. Rapid deposition causes crystals of zinc to shoot out and thus a cross between the plates might occur. If the number of lights is greatly in excess of the rating of the meter, the shunt might get so hot as to make a permanent change, and at any rate cause an error of several per cent. in the reading. If large quantity fell off to the bottom, it would short circuit the bottle.
- Q. 19 - What is the effect of using very many less lights than the meter is intended for?
- A. 19 - Oxidation of the plates causes the losing plate to show too small a loss, the oxide adhering, the oxygen is added to the plate. Besides it increases the resistance of the bottle, the oxide hiding a portion of the surface. The meter will read low in a certain proportion as the lights are less than the rated power of the meter. In some cases the gain will be more than the loss, and bring the company in debt to the consumer. A correction for oxidation will be given hereafter.

- Q. 20 - When you put in a meter, how do you know what size to put in, and how do you ascertain the lamp hours?
- A. 20 - Look at the canvas and ascertain the number of lights there were burning every 30 minutes. In addition, it would be well to pass in front of the premises and count the lights, if possible. If a private house, general average will give you the right number of lights, then you can ascertain the lamp hours and place the meter according to the rule. If candle power of lamps higher or lower than standard lamp, take this into account.
- Q. 21 - Suppose there was a store wired for 50 lights, and an unknown number was to be used, and you had to put in a meter, what size would you use, and how would you determine the size?
- A. 21 - Go at night in front of the place, and count the actual number burning, also look at the canvas to ascertain what number of gas jets there were burning every 30 minutes; from this you are enabled to ascertain the size of the meter.
- Q. 22 - Suppose one bottle of a meter gave a loss of 1000 milligrams, and the other 450 the first month you put it in. How would you proceed to ascertain the proper bill to present to the consumer; also, what would you do to ascertain the cause of this difference; and if you could not ascertain, what would you do, and if you changed it for another meter, and brought the first one to the station, what would you do then?
- A. 22 - Knowing his lamp hours, it would be possible to judge in which bottle the error lay, and the bill might be doctored up by keeping an eye on the consumer and noting his average lamp hours. Since all meters are tested before issue, the first point would be to look over the weight record and see if any error could be detected. Failing in this, the meter should be inspected at once; and any loose connection, break in the strands of the flexible wire, bends in the shunt causing two or more of the corrugations to touch, &c., corrected. If no defects are visible, or if there is something not easily corrected, it will perhaps be best to change the meter. On bringing it back to the station it should be taken apart, and after making necessary corrections, run it with the next lot to be tested.
- Q. 23 - Suppose you had charge of a station where they run only in the day time and the meters had no temperature regulators to prevent freezing; you were about to start this station in August; you were also to run it through the winter and be held responsible for the meter department, what would you do to come out with honor?
- A. 23 - The meters must be placed in that part of the building where it would always be warm and dry and never fall below 35 degrees Fahr. These conditions should be noted every month when taking the meter whether there was any probability the would continue. If the meters were provided with thermostatic regulators they would be valueless in the day time, as there would be no current on the mains to work the heating lamp.
- Q. 24 - What is the cause of the little bubbles that attach themselves to the zinc plates?
- A. 24 - The bubbles are due to the gas resulting from the electrolysis of the solution and appear when the bottle is worked too hard, i.e., when the current is too strong and the solution becomes too acid. The acid probably increases local action on plates. The bubbles are hydrogen.

Q. 25 - Which plate do they attach themselves to?

A. 25 - Grower says both plates. Conant says to the negative plate where the reduction of zinc takes place.

Q. 26 - What harm do these bubbles do, and how do they do the harm?

A. 26 - They diminish the area of the plate in contact with the liquid, and thus increase the resistance of the bottle and cause the bill to be too low. Grower says they increase polarization, making low reading, but this, he says, is slight.

Q. 27 - What do you do to correct the bubbles?

A. 27 - Use pure sulphate zinc, properly standardize, carefully wash plates free of all amalgamating acid, and do not overload the meter so as to produce free acid and thus cause the bubbles.

Q. 28 - What change, if any, takes place in the solution after being used a month?

A. 28 - It becomes slightly acid.

Q. 29 - What result does this acidulation produce?

A. 29 - Formation of bubbles, low reading of meter; it increases resistance of liquid by diminishing area of plate contact; on the other hand the acid causes the solution itself to diminish in resistance. The acid also acts on the plates.

Q. 30 - How do you proceed to amalgamate a new zinc plate?

A. 30 - The plate must first be cleaned with caustic potash, if very greasy, or, under ordinary circumstances, with emery cloth. It is not necessary that the entire surface be made bright, but the top of the plate and also the copper wire should be bright, so that the marine glue will stick, and also so that there will be a good connection between the wire and shunt-post. Then give the top of the plate, and the wire for an inch, several coats of marine glue. When this has set, which it does in a short time, dip the plate into mercury covered with acid water, and then upon removing rub well with a stiff brush.

Q. 31 - How do you amalgamate a zinc plate that has been used?

A. 31 - It is always well to clean the top of the plate and the copper wire, giving them a fresh coat of marine glue; then dip into mercury.

Q. 32 - Is it essential that the mercury should be pure?

A. 32 - Yes. Metallic impurities other than zinc will pass on to the plate and cause very great local action. Organic matter is easily taken up by mercury.

Q. 33 - How do you test the mercury for purity?

A. 33 - The mercury should run in globules across clean glass and leave no mark or trail visible by reflected light. A drop evaporated by heat should leave not the slightest trace of residue.

Q. 34 - Is it essential that the sulphuric acid used in amalgamating the zincs should be pure; also the water?

A. 34 - Clear, transparent sulphuric acid and clear spring water will answer; distilled water and chemically pure sulphuric acid are best where they can be procured easily and cheaply.

- Q. 35 - How do you test the sulphuric acid, and what are the impurities you test it for?
- A. 35 - By diluting with pure water and testing for iron by ammonia, organic matter by permanganate or potash, and general metallic impurities by ammonium sulphide.
- Q. 36 - What kind of water do you use to amalgamate the zincs with?
- A. 36 - Clear spring or well water.
- Q. 37 - How do you obtain distilled water?
- A. 37 - Condense steam, but this is apt to contain iron; boil and filter rain water; distill the water in regular still and worm; buy the water in carboys; boiled snow water; ice melted.
- Q. 39 - How do you test the water to see if it is pure, and what do you test for?
- A. 39 - The water should be tested for metals by ammonium sulphide. If unchanged in color, the water may be considered practically pure; but to be sure of iron salts, acidulate the water slightly with hydrochloric acid and use sulphocyanide of potassium, which gives a red coloration.
- Q. 40 - Do you test water for organic impurities, and how?
- A. 40 - Yes.
- Q. 41 - Does distilled water become impure by standing?
- A. 41 - Not if tightly corked and sealed and out of contact with the air, otherwise it becomes filled with animal life.
- Q. 42 - How do you propose to keep your distilled water?
- A. 42 - It may be kept in glass-stopper bottles or well cleaned carboys, which may be bought for \$1.50 to \$2.00 each.
- Q. 43 - How do you test the purity of your sulphate of zinc, and what do you test for?
- A. 43 - Sulphide of ammonium gives a perfectly white peroxide; any coloration denotes metallic impurities.
- Q. 44 - What is the object of coating the copper rod holding the zinc plate, so the surface of the copper does not come in contact with the liquid?
- A. 44 - One object is to prevent the formation of a battery of which the zinc and copper are the two elements, thus making local action within the liquid; also, to prevent the mercury from eating the copper away where it is secured to the zinc, probably causing bad contact and hence higher resistance.

- Q. 45 - What would be the effect if the copper was poorly coated, so that some of it came in contact with the solution?
- A. 45 - Theoretically the effect would be to reduce the resistance, and also cause the setting up of a local action between the plate and the copper wire; practically it is enough if the wire is covered to guard against contact with the mercury during amalgamation and the joint well protected.
- Q. 46 - When you take the plates out of the bottle after being brought in, what do you do first?
- A. 46 - Take hold of the copper wire of the weighed plate, unscrew the nuts, take off the negative plate, rap the bolts through, shake off the washer and block, rinse the weighed plate with clean water and put it away to dry on a piece of paper upon which is written the number of the meter bottle.
- Q. 47 - Do you weigh the plate of the A bottle, then the B?
- A. 47 - It may be a better plan to weigh all of the "A" plates and then all of the "B" plates. The idea of this being that an error made in weighing one plate may be repeated on the next, and if confined to one meter would not show so readily as if it occurred in two. Thus, suppose a man had called a 20-gramme weight a 10 and repeated the error on both the A and B plates. The error would not show because, both weights being low by the same amount, the apparent loss would be the same in both. Suppose, on the other hand, that two "A" plates were weighed successively and the error repeated in them, the chances are that before the B plates were weighed the error would be either detected or else, without noticing that an error had been committed, the weigher might get on the right track and find by a comparison of loss on the two plates just where the error came in. This is all very well when plates come in, as a man has a check on his work by comparing the loss on the two plates. When, however, he is weighing plates for issue, he must use the greatest care in avoiding such errors by examining the weights from time to time and duplicating all weighings. In making such duplicate weighings all of the plates should be first weighed and the weights recorded on a slip of paper. Then the man should begin with the first plate weighed and go through the list, replacing on the pan the weights recorded on the papers.
- Q. 48 - What would be the per centage of error in a bill for \$10 in one month on a meter, if the customer stopped using the light for the last 15 days of the month?
- Q. 49 - If you received, at a station that you were about starting, a large lot of meters with parts, what things would you examine particularly in making up each meter before setting it for a consumer?
- A. 49 - All of the connections, the joints of binding-posts on flexible wire, the shunts, to see that the corrugations did not touch and also examine the plates to see that the wires were fixed firmly. The shunt would also be tested for accuracy and the thermo-strip adjusted (see ).



- Q. 50 - Does oxidation of the plates interfere with the accurate recording of the meter?
- A. 50 - The effects of oxidation and source of error and amount of same is shown elsewhere.
- Q. 51 - In what instances does it most seriously interfere?
- A. 51 - In the case of a small number of lights on a very large meter, or a meter which is right for winter consumption is affected seriously by oxidation in summer, owing to small consumption.
- Q. 52 - Suppose you were starting a station where temperature regulators were to be used to prevent freezing of the sulphate of zinc solution and you received the meters not adjusted for temperature, how would you adjust them to light the lamps at about 40 Fahr. in the absence of a refrigerator?
- A. 52 - A single one could be adjusted by placing it in a box containing ice. The others could then be set by using a thin piece of metal to gauge the distance between the set screws.
- Q. 53 - How near should the plates be weighed; i.e., how accurately?
- A. 53 - Within 1 to 4 milligrams, according to the amount of light used; where a party uses but little light close weighing is best.
- Q. 54 - If you could weigh a plate in five minutes to one-fifth of a milligram, how quick could you weigh it within 5 milligrams?
- A. 54 - About two minutes.
- Q. 55 - What wears a delicate balance out?
- A. 55 - Leaving a heavy set of weights on the scale-pan for a long time; weighing too heavy loads; careless handling, that is, forgetting to run up the side supports before changing weights, allowing it to swing too suddenly. You may injure a balance by running up the side-arms too rapidly and causing the beam to jump on its agate bearings.
- Q. 56 - How long ought a set of small weights to be used?
- A. 56 - They should be tested from time to time by comparison with a standard and any error noted, but the life-time of a set of small weights depends more on the care they receive than anything else; under any conditions they should last a year and ought to last two or three years.
- Q. 57 - How do you place on and take off these weights?
- A. 57 - With brass tweezers.
- Q. 58 - Does this not wear them out in time?
- A. 58 - Yes; the tweezers ought to be tipped with kid to prevent abrasion of the weights.
- Q. 59 - Is there not great liability of errors being made in using a great number of little weights in counting up the totals?
- A. 59 - If you count from the box and then from the weights, and write the value of each weight on the paper as it is noted, the chances of error will be very small.
- Q. 60 - In putting in two meters in one place, one on the A and one on the B, how do you get the right polarity?

Q. 61 - Does it make any difference if the meter-plates are not in the middle of the bottle?  
 A. 61 - It is best to have them in the middle.

Q. 62 - Suppose one of the plates were back against the side of the bottle and touched on both edges; what difference would this produce, and how?

A. 62 - It would diminish the conductivity between the plates; the resistance would increase, as the liquid distance which the lines of force must travel will be increased in length and diminished in bulk.

Q. 63 - What is polarization of electrodes?

A. 63 - The metal reduced during the action of electrolysis shows a tendency to return to its previous condition. This reduction sets up an opposing E. M. F. which tends to produce a current contrary to the direction of the electrolyzing current.

Q. 64 - How do you ascertain the constant, so that with a given meter and given lamp you can give the constant?

A. 64 - Knowing the current per lamp, the relative resistances of shunt and bottle circuit, and the loss in weight due to one ampere. We multiply this loss by the fraction of an ampere passing through the bottle for each lamp. This gives us the lamp hour constant. Dividing the price per lamp hour by this, we obtain the constant factor, by which the loss in grammes is to be multiplied in calculating a man's bill.

Q. 65 - Supposing with a 12 light meter and a lamp of 140 ohms., 104 volts, what would be the constant?

A. 65 - E. M. F. = 104 volts. R. = 140 ohms. Hence:-

$$C = \frac{104}{140} = \frac{E}{R} = 0.742 \text{ c.}$$

R. of bottle = 973 times R. of shunt. Hence:-

$$\frac{.7428}{973} = .00762 \text{ amperes through bottle per lamp.}$$

1 ampere removes per hour 1.224 gms. of zinc. Hence:-

$$1.224 \times .00762 = .00933 \text{ gms. zinc per lamp hour. Then:}$$

$$\frac{\text{Loss in gms.}}{.00933} = \text{lamp hours.} \quad \frac{\text{Loss in gms.}}{.00093} \times .0125 = \text{bill in dollars, or}$$

$$\text{loss in gms.} \times \frac{.0125}{.00093} = \text{bill in dollars, and hence we have for the}$$

$$\text{constant } .0125 \div .00093 = 13.4 + \text{and loss in gms.} \times 13.4 = \text{bill in dollars.}$$

$$\text{Brower says } .000058345 \text{ per lamp hour.}$$

$$\text{Conant says } .0009335.$$

Clarke says these are both substantially correct. Assuming that the average portion of the total current flowing, which passes through the meter bottle, is  $\frac{1}{973}$ th, also the value of the ampere second as 0.00034 gms., as experimentally determined. We have for the value of a candle hour:-

Volts	Ampere	Seconds	Gms.	Gms.
$104 \times \frac{1}{973}$	$\times \frac{1}{3600}$	$\times 3600$	$\times 0.00034$	= to 0.000058345
140	974	16		
Oms.	Candles.			

loss per candle hour, or 0.0009335 gms. per lamp hour.

- Q. 66 - Also with the same meter, a 220 ohm. lamp, 110 volts, what is the constant?  
 A. 66 - These are 10 C.P. lamps.

Volts	Seconds	Gms.	Gms.
110 x $\frac{1}{974}$ x $\frac{1}{10}$	x 3600	x 0.0034,	equal to 0.0006283
220	974	10	
Ohms.	Candles		
Loss per candle hour, or 0.0006283 per lamp hour.			

- Q. 67 - Can you put a 12 light bottle in a 6 light meter? What is the effect and the amount of error produced by it?  
 A. 67 - Yes. Assuming that a 12 light bottle can be put in a 6 light meter, and that with a 6 light bottle the average amount of current passing through the bottle circuit will be  $\frac{1}{974}$ th part of the total, we have the following conditions:-

With 12 light bottle.

With the 12 light bottle  $\frac{4}{3550}$ ths of the total current passes through the bottle.

With the 6 light bottle  $\frac{4}{3896}$ ths of the total current passes through the bottle. Taking the amount passing through with the 6 light bottle as correct, the amount with the 12 light bottle will be 9.747 per cent too great.

- Q. 68 - How would you prevent this?  
 A. 68 - By arranging the connections to the bottle, so that they would not fit any bottle but the right one, or use a piece of wood, so only the right bottle would fit the case.  
 Q. 69 - Suppose a customer, the New York Stock Exchange, for instance, had 400 lights, and they only lighted them on dark days, say 4 times a month, 20 minutes each time. What size meter would you use, explain why you would use it, and why the other sizes would not answer?  
 A. 69 - In the first place, let us calculate the lamp hours per month, 20 minutes x 4 = 80 minutes = 1.33 per month, 20 minutes x 4 = 80 minutes = 1.33 hours. 1.33 hours x 400 = 532 lamp hours. In the second place, let us see what the "waste grammes" per month would be. For the first district, the lamp hour constant is about 0.00092 gms. Hence in this case, we have 0.00092 x 532 = 499.44 milligrammes. Here we have a small loss, and on the other hand a very heavy current acting for a few minutes at a time. Hence the meter must, in order to indicate correctly, be the smallest size that will carry the heavy current with safety. In all probability, a 200 light meter would be the smallest size that could with safety be used. In this meter there would be 2 100 light shunts in multiple arc, and as the resistance of the bottle remains constant, it would be necessary, since the ratio between shunt and bottle resistance is doubled, to also double the constant.

Also, since the loss is small compared with the capacity of that size plate, the consumer should be made to pay for the oxidation, the value of which is about 320 mgs., as otherwise the bill will be low by that amount. The way to introduce the factor of oxidation into the bill, is to regard it as loss and add it to the indicated loss.

- C. 70 - How would you keep track of the changes in the customer's lights, so that the meter, no matter what changes took place, would be the right size?
- A. 70 - Inspect the district every now and then, keeping an eye on the lamp hours of the various consumers, and also note by the variations of meter readings, any changes in his lamp hours. More than that, the wireman must be required to notify the meter department at once of any change in the lights of any consumer.
- Q. 71 - Suppose both meter bottles came in with the deposit all granular, and a lot of it fallen to the bottom of the jar, and it was the first month's record. How would you ascertain the weights and be able to make out the bill within a reasonable certainty?
- A. 71 - This shows that the meter has been run too hard, but as you do not weigh the deposit, but always weigh the loss, there would probably be no trouble in making out the bill.
- C. 72 - Suppose when you went for the bottles, you found both cracked and the solution run out, what would you do, technically speaking, and how would you do about the consumer's bill, supposing he was using it the first month, and you had no previous bill to judge from?
- A. 72 - Clean up the meter, examine the thermo strip (if in winter), to see if its adjustment was correct, and if the accident took place in warm weather, see if anyone had been tampering with the meter. This would be a matter of observation, as it would not be well to question people and give the thing away, unless it were evident that some one had fooled with the meter, in which case the consumer should be made to pay for the damage, and pass his bill by average of past bills. In case it appeared to be a fault of the meter, the best plan would be to say nothing about it, and fix up the bill by what you had noticed of his burning during the month, and also by examining his previous bills. By weighing the plate, some clue might be obtained as to the time of the accident. And if perhaps the consumer had already told you that the meter leaked on a certain day, the weight would be some help in making out the bill; a periodical taking of lamp hours would be the best remedy to ascertain proximately the bill.
- C. 73 - Suppose the constant was figured on a 220 ohm. lamp, 104 volts to give 10 candles, and there was 108 volts on the mains at the feeders, 3 per cent drop on the mains, and two and a half per cent on the service and wiring inside the house, what would be the volts at the lamp, and what would be your constant?
- A. 73 -  $108 \times .97 = 104.76$  volts at mains on service.  $104.76 \times .975 = 102.2$  volts at lamp. The general formula is 
$$\frac{Q \times .0012566}{R} = \frac{102.2 \times .0012566}{220} = .0058 \text{ + gms. per lamp hour.}$$
- Q. 74 - Do you test your meters before you send them out, and how do you test them. Explain fully, and if you find one out, what do you do?

A. 74 - Yes. A number of them are placed in series, and a strong current, controlled by a number of standard lamps, passed through them for 10 or 12 hours. The results are then noted, and any meter showing an error of more than 2 per cent., thrown out. The theoretical loss of weight may be calculated beforehand, as you know the number of proposed lamp hours. The actual test is to see how closely the meters agree with this, and also how well they agree between themselves. It is always best to have a standard meter to compare the others with, as, owing to the fact that the pressure varies at the station much more in proportion than at the lamps in the district, the actual loss may differ by 3 or 4 per cent. from the theoretical, and the meters still be all right. If in any case a bottle reads too high, its resistance is too low, and to remedy this, we file the copper wire leading from the shunt to the flexible wire, on the side, to increase the resistance of the circuit. The meter is then tested again with the next lot. If the bottle reads too low, its resistance is too high, and so we shorten the connection with the shunt, then retest, &c. Should this fail to correct the trouble, and the error appear still very large, the trouble is in the shunt, and may be corrected by filing the shunt, if too low, or putting on a little solder to increase the cross-section, if too high. It is not well to fool with the shunts, and if they seem badly out, the meter should be returned to the maker.

Q. 75 - What is the object of reversing the current in a house-changing switch?  
A. 75 - To keep the current through the meter always in the same direction.

Q. 76 - What is a house-changing switch for?

A. 76 - To enable one to throw a customer over from the A to the B side, or vice versa, to maintain a balance between the two sides, and thus prevent too great a drop of E. M. F. in the mains.

Q. 77 - Suppose the A and B side circuits were run into a house and lights were put on both, how would you place the meter? Make diagram.

Q. 78 - What is the temperature-regulating strip made of, how made, and how does the temperature produce a movement?

A. 78 - It is made of brass and steel strips riveted together; when the temperature falls the brass contracts to a greater extent than the steel, causing the strips to bend and touch the platinum points.

Q. 79 - What kind of a lamp is used in the meter for heating, and what is the difference between it, if any, and a regular lamp?

A. 79 - The lamp used is an inferior lamp, not suitable for illumination; a certain percentage of poor lamps are made at the factory, and are called resistance lamps; they are sold at a reduced rate, and are used in meters.

Q. 80 - Does it make any difference what candle power lamp is used?

- A. 80 - Yes. The volts of the resistance lamps in the meter should be five or eight volts higher than the consumer's lamps, so the meter lamps will only come up to three or four candle power, and thus prevent breakage, they being unable to stand full incandescence for any length of time.
- Q. 81 - How much zinc is removed and deposited in one minute by an ampere of current?
- A. 81 - In one minute an ampere will remove .0204 gms. of zinc. The deposit is slightly less than this.
- Q. 82 - Supposing there were 10 amperes of current flowing with a pressure at the meter of 104 volts, how much more current would flow if the volts were raised to 107 volts?
- A. 82 - With the 16 c.p. lamps, having a  $6\frac{1}{2}$ " fibre, the current increases almost exactly in proportion to the electro-motive force. Assume it to be exactly proportional, the amount of loss on the conductor between the lamps and the meter will not affect the result required. The per cent. increase in current will be  $\frac{107 - 104}{104} = 2.885$  per cent.
- Q. 83 - If in one month the bill was 10 dollars, at the rate of 1 cent per lamp hour, and a constant pressure of 104 volts maintained, what would be the increase in the bill the next month, if a constant pressure of 106 volts was maintained?
- A. 83 - On the basis of the assumption in answer to question 82, that the current increases in direct proportion to the electro-motive force, the gain will be  $1000 \times \frac{106 - 104}{104} = 19.23$ , or nearly  $19\frac{1}{2}$  cents.
- Q. 84 - Do electric lamps increase or diminish their conductivity by rise of temperature?
- A. 84 - They diminish their resistance by rise of temperature.
- Q. 85 - What is the effect on the meter of a short circuit for 1 second of a 100 volt current across terminals of main at meters, but beyond the meter?
- A. 85 - The plug in the vertical main cut out would be burned out and probably no harm done to the meter, except that the shunt might for an instant be heated. The effect of the extra current in the meter for the time of 1 second would make no difference in the reading, for 1 ampere = .34 mgs. per sec.; roughly, we may say that  $\frac{1}{1000}$  of the total current goes through the bottle, so that for each ampere second we have .00034 mgs. A current of 1000 amperes would therefore cause only .34 mgs. to be dissolved in 1 second, and the plug would go long before the current reached this figure.
- Q. 86 - On cleaning old meter plates, what is the best to use, sand paper or emery paper?
- A. 86 - Sand paper, very finest.
- Q. 87 - Does not emery paper contain iron, and would not some of it be liable to get attached to the zinc?
- A. 87 - Yes; it contains iron, which might attach itself to plate and make local action.

- Q. 88 - What salt of iron is generally contained in emery?  
 A. 88 - Double salt of iron and alumina.
- Q. 89 - Name the different kinds of errors that may take place, so as to make a wrong bill for the customer?  
 A. 89 - Shunt not correct. Mistake in weighing. Solution out of order. Bottle wrongly placed. Bottle broken. Connections in meter broken. Too low or high lamp hours. Variations of pressure. Loose wire on plate. Poor contacts in meter wires.

- Q. 90 - What is the current-carrying capacity of the shunt in each size meter; I do not mean what current will it carry without heating, but what current will the shunts carry without injury for say from one-half of an hour to three hours run?
- A. 90 - When the meter shunts were first made their carrying capacity was estimated on the basis of the 16 candle power lamp, requiring  $3/4$  ampere per lamp. On that basis the shunt will carry 40 of these lamps and become slightly warm, or 50 lamps and become very warm. The latter was taken as the safe maximum limit (25 light meter), hence a meter shunt was said to be good for double the nominal capacity. Taking the same fundamental assumption, but change the lamps to those requiring  $1/2$  ampere (Village Plant 10 c.p. lamps), the maximum safe number of such lamps for a 25 light meter will be 75. From this is given a table below of capacity of meters:

Name of Meter	Nominal capacity 10 c.p. lamps.	Max. safe capacity to c.p. lamp.
6 lights	9 $3/8$	18 $3/4$
12 "	18 $3/4$	37 $1/2$
25 "	37 $1/2$	75
50 "	75	150
100 "	150	300

- Q. 91 - Suppose a plate gained 10 mgs. in a month, and yet was rightly placed, how could a bill be calculated?
- A. 91 - The action in the bottle was not strong enough to entirely overcome the oxidation. Thus suppose the oxidation of the plate would have been, if left to itself, 40 mgs., then we see at once that the loss must be considered as equal to 30 mgs. or 40 - 10.
- Q. 92 - What is the limit of monthly deposit?
- A. 92 - Conant says:-

6 light.	0.750 gms.
12 "	1.5 "
25 "	3.00 "
50 "	6.00 "
100 "	12.00 "

Clarke says, this is correct on the assumption that the max. safe loss of zinc from a 25 light meter is the amount taken off by 25 lights (requiring .92 ampere each) for 30 days, for  $3\frac{1}{2}$  hours per day. I prefer to reduce it to the following amounts:

6 light	.625 gms.
12 "	1.250 "
25 "	2.500 "
50 "	5.000 "
100 "	10.000 "

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With regard to question 20, which relates to the choice of meter, there is often used a rule to the effect that the proper size may be determined by ascertaining the lamp hours and dividing by 3; thus a 25 light meter is rated at 75 lamp hours per day. This is all very well as far as the bottle is concerned, but suppose that there were 75 lamps burning one hour, could a 25 light shunt carry the current? I think not, but that is a point we lack information upon. (Conant.)

Clarke says, my answer to Conant's first question answers this as far as the shunt is concerned. If the lamp hours per day divided by 3 gives a result which is less than the total lamps on at one time, then a larger meter must be taken. Suppose, for example, 75 lamp hours daily; dividing this by three gives 25 lights as the proper size of meter, but if 50 or more lights are on at one time, then the larger meter must be taken.



QUESTIONS AND ANSWERS RELATING TO RUNNING  
OF DYNAMOS

By W. S. Andrews.

- Q. 1 - What is the neutral point on a dynamo?  
A. 1 - The non-sparking point on commutator.
- Q. 2 - Why are the brushes set at the neutral point?  
A. 2 - To avoid sparking at brushes.
- Q. 3 - Does the neutral point change with the load? Explain how it changes, the direction, &c.?  
A. 3 - The neutral, or non-sparking point, travels forward in the direction of rotation with increase of load. The current, passing around wire of armature, polarises it in this direction, when the brushes are in the position represented:

At the same time the field magnet polarises it by induction in a line at right angles to the above, thus:

And the result of the opposing or partially opposing polarities is a compromise between the two, the actual polarity of armature assuming a mean position between the two, thus:

The exact position of polarity depending on the amount of current passing around armature, the strength of the field magnet, velocity of rotation, position of brushes on commutator, &c., &c. When the dynamo is carrying a light load, there is comparatively a weak current passing around the armature. No. 1 polarity is, therefore, weaker than No. 2, and the preponderance in strength of No. 2 brings the neutral point away down, in the direction opposite to rotation. A heavy load on the dynamo implies a strong current around armature, in which case No. 1 polarity becomes stronger than No. 2, and brings the neutral point away round, in direction of rotation, to nearly the top and bottom of commutator.

Q. 4 - Suppose you tried to set the brushes in the neutral point to stop sparking yet there was a great deal of sparking even at the best position, explain what are the several things that would cause it, and how you would prevent it, by stopping, and also that you would do if you could not stop the dynamo.

A. 4 - The sparking at commutator may result from several causes:-

- (I) Dirty or rough commutator.
- (II) Burnt or ragged brushes.
- (III) High bar or bars in commutator.
- (IV) A loose connection in armature.
- (V) Too heavy a load of lamps on armature, or a partial short circuit somewhere on the conductors.

To remedy the

- (I) Clean the commutator carefully with sand-paper, without shutting off the current.
- (II) Remove and examine each of the four brushes, one at a time, and if either of them is badly burnt, put a new one in its place until it can be filed up into proper form.
- (III) See answers to questions 22 and 23.
- (IV) The spark would be a very bright blue, snappy one, and would only occur when the commutator bar leading to loose connection passed the brush, though on account of the rapid rotation of armature, the sparking might appear as if all round the commutator, to an ordinary observer. By looking closely and steadily at revolving armature, it will appear as if stationary, or not revolving, for the reason that the spark happens only during each revolution at exactly the same place every time, and whilst the armature is in exactly the same relative position with regard to other parts, the eye only really sees the armature throughout the duration of spark, which occupies only a very small fraction of a second, but owing to the illusion, commonly expressed as "persistence of vision," the successive glimpses are carried over and blended one into the other, and the effect of a continuous picture of the armature in one position is presented to the eye. To remedy this spark, for the time being, set one of the two brushes on each side of commutator, a bar and a half (or thereabouts) ahead of its companion brush, so that when the broken or loose connection comes round, the main circuit will always be complete through two of the four brushes.

After the run, the cover next the commutator end of armature must be taken off and all the soldered connections carefully examined, and the loose one re-soldered. In the case of the H dynamo, as now made, it may simply be that one of the gilt-headed screws has worked loose, causing imperfect connection. Whilst cover is off, all the soldered joints should be carefully examined, and the screws tried all round. The dynamo

may then be started up, and the current thrown on to test line of lamps, and, if found to be all right, cover can be replaced.

- (V) This cause of sparking may be easily detected at the amperes meter, which will be unusually deflected towards the side, where the heavy load of lamps, or the partial short circuit of conductors, should occur. In the case of an excessive load of lamps, a proper person should be immediately despatched to some of the places that are provided with house changing switches to throw them over on the other side, and thus balance up. In case of a partial short circuit, keep the dynamo running, with brushes well forward on commutator in direction of rotation, and send out immediately to ascertain and remedy the cause of the trouble. A dead short circuit would burn out dynamo safety catches immediately, in which case the short circuit must be discovered and removed before again throwing dynamo on line.

Q. 5 - How should the ends of the brushes rest on the commutator?

A. 5 - Every part of the beveled end of brush should rest on commutator.

Q. 6 - How do you ascertain that the brushes are set exactly on opposite sides of the commutator, and what would be the result if they were not opposite?

A. 6 - The easiest and quickest way to ascertain this is to set a pair of large-sized callipers to the diameter of commutator, and try them over. The points will then, of course, touch opposite bars. It may also be found by counting the bars, thus: Suppose there are 54 bars in commutator, and each brush covers the width of two bars. There will then be altogether, four bars covered by the brushes, which will leave 50 bars clear. Half of these fifty should be on one side and half on the other. Therefore, count the number of bars on upper side of commutator between the brushes, and if there are just 25, the brushes must be opposite to each other. The result of their being set not opposite would be the impossibility of setting the brushes on both sides exactly on the neutral point of commutator; for, if one pair is on the neutral point on one side, the other pair must be off it on the other, and one or other pair of brushes will be sure to spark to an extent only limited by the error.

Q. 7 - What is the object of changing the position of the brushes on the commutator sideways every day or so?

A. 7 - To prevent the commutator from being worn in grooves and runs, by the constant friction of brushes always in one place.

Q. 8 - What danger is there to the armature if the bearings wear down very much, and how do you ascertain that the bearings are worn down considerably?

A. 8 - If the bearings wear down considerably, the armature will rub on the bottom of the field blocks, and this will probably loosen and untwist a portion of the brass binding wire, and might very easily ruin the armature before engine could be stopped. This is a point that engineers should watch very carefully. By simply observing the position of armature in the field blocks, it may be readily seen if the armature bearings are worn down to any dangerous extent. To remedy a small amount of wear, the pillow-blocks may be raised with cardboard or sheet-iron, but if they are badly worn, they must be re-babbitted.

- Q. 9 - Suppose bearing of a dynamo got very hot and you could not stop, what would you do?
- A. 9 - Put the oil can in a pail of cold water, with some ice in it, if possible; then unscrew oil-cup from bearing that heats, and liberally supply the bearing with cold oil, keeping a second oil-can cooling in the pail to continue the operation. Avoid using cold water or ice, unless the first method absolutely fails to reduce the heat. Water and ice are very apt to contain gritty particles, which will remain in the bearing and increase its tendency to heat, when supply of cold water or ice is stopped.
- Q. 10 - Suppose you had two dynamos in multiple arc, that is to say, 2 dynamos on the A side, and the belt or one should break, what would you do?
- A. 10 - Jump instantly for switch on head-board of dynamo with broken belt, and open it. Then throw in spare dynamo, if there is one, whilst mending belt. A belt punch and laces will be found the quickest way to mend a belt temporarily.
- Q. 11 - Suppose you had two dynamos on the A side and one of the armatures got very hot, i.e., you could smell or feel the effect of the heat, what would probably be the cause of this heating over the other machine, and how would you stop it?
- A. 11 - This would intimate that the E. M. F. of hot armature is higher than that of cool armature, and that the hot one is not only assuming the entire load of lamps on that particular side, but also that it is driving the dynamo coupled in multiple arc with it as a motor. The cause of this forward, in direction of rotation. Therefore, set brushes of cool machine further back in direction opposite to rotation, which will bring up the E. M. F. of cool dynamo, or else put brushes of hot dynamo forward, in direction of rotation, which will lower its E.M.F. If both dynamos are running in the same direction, the brushes of each should rest on commutator in similar positions, but if they are running in opposite directions, the dynamo that is running from right to left (facing switch-board) should carry its brushes farther forward, in direction of rotation, than the other.
- Q. 12 - Supposing there were two machines in multiple arc across the B side and you wanted to load equally or unequally divided, how would you do it?
- A. 12 - Answer to previous question covers this ground partially, provided the brushes of both dynamos are set in right positions relatively; the E. M. F. of either machine may be varied by introducing extra resistance in its field circuit. To insure equality of resistance in the field circuits of two dynamos connected in multiple arc, their respective resistance-boxes are coupled by a mechanical arrangement of bevel gear, so that both are moved simultaneously and alike.
- Q. 13 - Supposing you had two machines in multiple arc across the B side, each driven by a separate engine, what difficulties are there likely to occur?
- A. 13 - The speed of the engines is liable to differ. The engine revolving the fastest will produce in its corresponding dynamo a higher E.M.F. when the effects described in the first portion of Answer 11 will take place. If the governors of engines are not very sensitive and quick acting, the addition of load due to increase of E. M. F. will then increase in speed and produce the same result, until it is again slowed down by its assumption of load, and so the effect known as see-sawing will be produced, and will continue indefinitely until both engines and dynamos are properly regulated so as to work together.

- Q. 14 - Supposing you had a dynamo on the B side run by one engine, and you desired to put a second one across in multiple arc with it, please state how you would proceed, and what particular things you would ascertain before connecting?
- A. 14 - First put in the plug of the proper resistance-box, and note when spare dynamo has charged its own field. Then close double main switch in the right direction, and the spare dynamo will at once assume its share of the load, if conditions stated in former answers are fulfilled.
- Q. 15 - Suppose one dynamo was on the B side, and you attempted to place another dynamo across multiple arc with it, and the field magnet was either not charged at all or not fully charged, what would be the consequences?
- A. 15 - The armature of dynamo, whose field is imperfectly charged, will make a dead short circuit across line, lamps will go out, and if the circuit is not immediately opened, one or both armatures may be burned.
- Q. 16 - Suppose you had two dynamos run by separate engines, the dynamos being in multiple arc, and the engine of one got jammed in the bearing suddenly, what would be the first thing you should do?
- A. 16 - Immediately open the switch on head-board of dynamo that is belted to injured engine, then shut down engine and throw in spare dynamo in place of the one cut out, if possible.
- Q. 17 - Suppose there were two dynamos working in multiple arc from one engine, and the belt slipped on one and not on the other, what would be the result?
- A. 17 - The E. M. F. of dynamo whose belt slips will fall, and the other will immediately assume more than its proportionate share of load, and will therefore heat up.
- Q. 18 - Make diagram of the manner of connecting up the field magnets of an H dynamo?
- A. 18 -

Outside wires are connected together between poles. Inside wires are multiple arc'd and brought to respective binding posts. Outside wires are single. Inside wires are treble.

- Q. 19 - What is the object of breaking a circuit in two places simultaneously?
- A. 19 - To lessen the spark ----.
- Q. 20 - What is the effect of water on the field magnet and armature of a dynamo?
- A. 20 - Wet canvas or paper forms a partial conductor. The result would, therefore, be most probably a serious leakage of current, and in the case of the armature it might generate sufficient heat to carbonise the material and cause the armature to burn out.
- Q. 21 - What is the cause of the ring of fire around the edge of the commutator one sometimes sees, and how do you stop it?

- A. 21 - This defect is generally caused by small pieces of copper between the bars of commutator, making a local short circuit from bar to bar across the mica insulation. To remedy it, clean the commutator with 00 sand paper, and look carefully over the mica insulation, and if any small particles of copper are to be seen in the mica connecting, or nearly connecting, two bars, remove the same with the point of a sharp pen-knife, using great care not to cut into the mica.
- Q. 22 - Suppose you had great sparking on one machine after starting for the night run, and could not stop, and the next morning on stopping you found one bar badly burned, explain what could have caused it, and what you would do to stop it for the next night's run?
- A. 22 - This might be the effect of:-  
 (I) A loose or high commutator bar.  
 (II) A loose connection between wire of commutator bar and wire of armature.
- To remedy:-  
 (I) Apply a heavier tension to the spring of brushes, for the time being until the bar can be fixed. When the run is over, turn the armature round slowly, and find out the high bar. This may easily be felt by passing the hand round commutator, or by observing which bar is most burnt by the spark. Carefully file down the high bar or bars so as to leave no flat place anywhere. A single high bar in a commutator will knock and vibrate the brush, making a spark, and owing to high speed of revolution, the sparking will appear as if all round.  
 (II) See Section (IV) of answer No. 4.
- Q. 23 - Suppose you had had sparking and could not stop, how would you ascertain that the sparking was only at one place, although it looked as if it was all round the commutator.
- A. 23 - See Section (IV) of answer No. 4.
- Q. 24 - How would you arrange things to wear the commutator down evenly and get the greatest life out of it?
- A. 24 - Every two or three days shift the brushes sideways on brass stud that carries them. By doing this nearly the whole surface of commutator can be subjected to an equal amount of wear.
- Q. 25 - Suppose an armature suddenly commenced to smoke badly, and you had to stop, and found a turn of wire around the armature blackened, what is the cause and how would you fix it so you could run next night, and would you continue to run it as fixed?
- A. 25 - The cause is a local short circuit in that particular turn. To remedy it for the time being, take off cover of armature next commutator, and sever the connection between burnt wire and commutator bar. Bend the severed end of wires back on themselves, and heavily tape them. Then arrange brushes as shown on page 5. This is only a temporary make-shift. A new armature must be immediately telegraphed for, and the old one must be sent back to be repaired; as soon as the new one has been put in and found to be all right, the commutator block thus disconnected should be connected to its neighbor or one brush set ahead of the other to bridge over the break.
- Q. 26 - Suppose one of the wires connected to one of the legs of the field of a dynamo became detached, and you were working two machines in multiple arc, what would be the consequences?
- A. 26 - The field being no longer magnetized, the current generated by the other dynamo would be short-circuited through armature.

- Q. 27 - How often would you go over the connections of the various apparatus at the station to see that everything was right and in good contact?
- A. 27 - At least twice a week.
- Q. 28 - Explain the principle of the lightning protector; how you would work it?
- A. 28 - The entire electrical circuit formed by armature, and outside lines with lamps attached, should be free from any connection to ground under ordinary circumstances. During a thunderstorm the outside lines are liable to gather atmospheric electricity, and when this charge reaches a sufficient tension, it will jump to any near conductor that is connected to ground, and it is liable to char or set on fire any combustible substance that happens to lie in the path of the spark. To avoid all accidents a lightning protector has been devised, by means of which all three of the omnibus wires may be either dead grounded or partially grounded through any requisite amount of resistance.

The above sketch will show that when all plugs are out there is no ground. Plugs being put into three right hand holes make a ground through resistance, and by being moved into the three left hand holes they make a dead ground direct. When the dynamo are not in use the omnibus wires must be kept dead grounded, so that should a storm arise any charge of atmospheric electricity that may gather on the outside wires may immediately pass away to ground without encountering any obstruction. Should a storm arise whilst the dynamo are running, to put a dead ground on the omnibus wires would short-circuit both dynamo, therefore they must be grounded through resistance. Thus there will be only a small waste of the dynamo current, but an exit will be provided for any atmospheric electricity of high tension that may be collected on outside wires. Whilst running dynamo in fair weather all the plug switches of lightning protector must be open.

- Q. 29 - What is a volt?
- A. 29 - The volt is the unit of electrical pressure, and signifies that amount of pressure at which 1 ampere of current will pass through 1 ohm. of resistance.
- Q. 30 - What is an ampere?
- A. 30 - The ampere is the unit of electrical quantity, and signifies that quantity which at a pressure of x volts will pass through x ohms.
- Q. 31 - Explain the principle and use of the ampere meter?
- A. 31 - When a current of electricity is passed through a wire running parallel with a magnetic needle, it tends to turn the needle to point at right angles to the direction of current, the north seeking pole of needle always diverging to the left hand of the direction of current in parallel conductor. This divergence is limited by the amount of current passing through conductor and the directive force of magnetic needle. In the ampere meter in question, a needle of soft iron is pivoted on a delicate steel axle working in jewelled holes. Underneath the needle is a flat bar of copper, heavy enough

to carry, without heating, the greatest amount of current that the ampere meter is intended to show. The soft iron needle is kept constantly magnetized, and also parallel to the copper bar, by a permanent horse shoe magnet set in the proper position. This permanent magnet has adjustable pole pieces, whereby the strength of its inductive influence on the needle of soft iron may be modified. The permanent magnet tends to keep the needle parallel with copper bar, whilst any current passing through the bar tends to diverge the needle to point at right angles to it. Therefore a pointer attached to needle will show on a scale the amount of current passing through copper bar. The ampere meter is interposed in the omnibus compensating wire of the three wire system to show if there is a proper balance existing on the red and blue sides. When the system is exactly balanced the pointer of ampere meter will stand at zero, which will show that there is no current passing through the compensating wire. When either side gets out of balance, the pointer, by diverging to the right or left will show which side is carrying the heavier load, and the amount and direction of current traversing the omnibus compensating wire.

- Q. 32 - Explain the principle of the pressure indicator and its use?
- A. 32 - The pressure indicator, or volt measurer, works on precisely the same principle as the ampere meter. The single heavy conductor of the ampere meter is exchanged for a coil of wire, which surrounds the soft iron needle in the direction of its length. This coil of wire is connected across the line like a lamp, and a certain amount of current will pass through coil from positive to negative. This quantity will be limited by the pressure, or E. M. F., existing at point of connection. The higher the E. M. F. the greater the amount of current, and consequently the greater the divergence of the needle. The pressure indicators in a central station are connected to iron wires, termed pressure wires, which run on the poles away from central station and are connected to the end of the feeders. They will therefore measure the E. M. F. at end of feeders, LESS the drop on the iron pressure wires. To ascertain the amount of drop on iron pressure wires test when lamps are turned off the circuit, which will practically reduce the drop of E. M. F. on feeders to nothing. Now read E. M. F. or volts at the end of any pair of pressure wires and compare it with the volts of the dynamo that feeds it. The difference of E. M. F. will be the drop on the pair of iron wires in question, and this must always be allowed for when reading the pressure at the end of feeders. The dynamo should be run up to its normal E. M. F. whilst making this test.
- Q. 33 - Supposing you had 110 volt lamps and had, when the full load was on, 2 per cent. loss within the consumer's premises and 3 per cent. on the mains, what should be the pressure at the ends of the feeders?
- A. 33 - 110 volts at lamps with 2 per cent. drop within premises would be 112.25 volts outside premises, and a further 3 per cent. drop on mains would necessitate a pressure of 115.75 volts at end of feeders.
- Q. 34 - Supposing there was but half a load on, and you wanted to keep the lamps at the same candle power as they were when there was a full load, would you keep the same pressure at the ends of the feeders as with a full load, or what would you do?
- A. 34 -



- Q. 35 - What is the result in cost if the lamps are kept, say 5 volts, higher than they are marked?
- A. 35 - I should say that the additional cost of lamps to company in a year's run would amount to 200 per cent. or 500 per cent. more than if they were kept at the right volts.

- Q. 36 - Supposing late at night the load in a certain part of the town was very light, and continued heavy in another part of the town, what would be result at the ends of the feeders, supposing station pressure was right for the heaviest load, and what would you do to lessen the great pressure at the point mentioned?
- A. 36 - Introduce resistance into the feeder that was carrying the light load, until the pressure indicator showed normal volts.
- Q. 37 - How can you tell that a lamp has died naturally or been broken by the consumer?
- A. 37 -

- Q. 38 - How do you propose to ascertain the exact number of lamps furnished consumers, broken naturally and accidentally, and account for every lamp at the end of the year?
- A. 38 - I should keep a lamp account book as follows:

Sunderly Lamp Account											New Lamps 10 C.P.			
Date of Install- ment	Name of Consumer	No. of Lamps In Use		No. of Spare Lamps	Broken Lamps Rec'd.						Date	Where From	No.	
		3d.	1st.		July		August		Sept.					
					1st	15th	1st	15th	1st	15th				
1883 J'y 10	John Smith	10	...	6	...	1	...	1	...	...	1883 Aug. 1	Lamp Fac- tory	250	
" 14	Peter Jones	...	14	6	...	...	2	...	...	...				
" 15	Henry Robinson	5	...	3	...	...	...	2	...	...				

By footing up the first two columns, the number of lamps on each side of system may be determined. Let two days every month be chosen for collecting broken lamps and supplying new ones, say 1st and 15th of each month. An unusual percentage of breakage by any one consumer may be seen at once, and at any time the lamps may be checked off, to see if any have been lost or stolen. The total of the first nine columns, plus the new lamps in stock, should equal the number in last column. The total of the six columns under title, "Broken Lamps Rec'd," should agree with the number of broken lamps at station.

- Q. 39 - Suppose there was a great wind storm took place in the day time before you started up for the night's run, what would you do?
- A. 39 - Send round a competent person immediately to inspect all lines, and if any visible damage has been done have it repaired. Then get up steam as quickly as possible and test all circuits with a low volt current at first, so as to save safety-catches in case of a possible short circuit that may have been overlooked. If everything went all right raise volts to usual pressure and run for a few minutes.
- Q. 40 - Supposing another wire, say a telephone wire, should fall across the pressure indicator wires, what would be the consequence, and what would you do?
- A. 40 - A case of this kind occurred at Sumbury shortly after we commenced lighting. Engineer started up, as usual, half an hour before regular lighting time, and it was found that a dead short circuit existed. I immediately sent a man to inspect one circuit, whilst I went over the other myself, and at the end of circuit found a No. 18 copper telephone wire had broken and was hanging over and touching three of our lines. I had this cut away and all went off right. As our lines are generally carried over telephone and telegraph wires, this is a casualty seldom likely to occur. The engineer should, however, start up every evening at least half hour before dusk, and test the lines for a few minutes with a low volt current of say 50 or 60 volts given by half speed of engine.
- Q. 41 - Calculate the size of wire for a service 150 feet from the main to the back end of the consumer's premises, which would give a 1 per cent. loss with 17 lamps, also with 30 lamps, also with 2 lamps?
- A. 41 - Resistance of seventeen 10 c.p. lamps = 14.7 ohms. (250 ohms. per lamp). Since 1 per cent. of current is to be lost in wire, 99 per cent. must be utilized in lamps, therefore the wire must have  $\frac{1}{99}$ th part the resis. of lamps - or .1485 ohm.

	Ohms.	
Resis. of 19 lamps	= 14.7	= 99 per cent
Resis. of service	.1485	= 1 per cent
<hr/>		
Total resis. of lamps and service	= 14.8485	

150 feet service x 2 = 300 feet, so the size of wire must be chosen, 300 feet of which must closely approximate the resis. of .1485 ohm. The lineal foot resis. of No. 9 pure copper wire B. V. G. is .000471 ohm. 300 feet of this would measure .1413 ohms., but as we are dealing with ordinary copper wire prepared for electrical purposes, and not with pure copper, it will be about right to add 5 per cent. to this theoretical resis., which will bring it up to .1483 ohm. Therefore by using No. 9 wire for this service there will be a loss of current in wire of a very small fraction less than 1 per cent.

Resis. of 2 lamps = 125 ohms.  $\frac{125}{99} = 1.2626$ . The nearest size of wire

The nearest size of wire is No. 18, 300 feet of which would measure 1.35 ohms. (adding 5 per cent. to resis. of pure copper). With this size of wire there would be a loss of  $1 \frac{8}{100}$  per cent. If the question

implies that the exact diam. of wire in  $\frac{1}{1000}$ ths of an inch shall be ascertained to give exactly 1 per cent. drop in each case it must be calculated by cir. mils. By approved tables pure copper has a resis. of 10.32511 ohms. per mil. foot, and adding 5 per cent. for impurities it would be 10.83927 ohms. For 30 lamps, the actual resis. for a 150 feet service = 300 feet of wire, allowing 1 per cent. loss, should be .08418 ohms. The resis. of 300 mil. feet would be 3251.781 ohms., and  $3251.781 = 38629 =$  cir. mils. in required wire, and  $\sqrt{38629} = 196.5$  mils. .08418

diam. (The diameter of No. 6 wire is 203 mils. and the loss a trifle less than 1 per cent.) As however it is difficult to get wire drawn commercially by the mil., I think it needless to give more than the above single example, as in all cases within my knowledge, the nearest commercial sizes have always been used.

- Q. 42 - Supposing a customer was wired for 25 lamps, how would you ascertain the proper way to calculate the service?
- A. 42 - Let  $x$  per cent. be the loss allowed in service, then  $100 - x$  per cent. is utilized in lamps, therefore the service must have  $\frac{x}{100-x}$  resis. of lamps. The resis. of 25 lamps being 10 ohms., the resistance of the service must be  $\frac{x}{100-x} \times 10$  ohms. Let  $x = 2$  then  $100 - 2$  per cent., or 98 per cent. of current, is utilized in lamps, and the resistance of the service must be  $\frac{2}{100-2} \times 10$  ohms. = .204 ohm.

	Ohms.	of total resis.
Resis. of lamps	= 10.00 = 98 per cent. )	of lamps and
Resis. of service	= .204 = 2 per cent. )	service.
Total resis. of		
lamps, and	) 10.204	
service,	)	

- Q. 43 - What is the result if two wires are run parallel and flat in a ceiling, and water gets between them, also the effect on a cut-out if water gets on the back of it?
- A. 43 - In both cases a short circuit will most likely happen, and unless protected by a safety-catch between it and supply it would probably do considerable damage. I saw an "L" armature burnt out in Cornwall, Canada, through a short circuit occasioned by a leaky roof.
- Q. 44 - Suppose the B side main line suddenly crossed and the safety catches burned out in all the feeders on that side, what would you do?
- A. 44 - Keep on running the other side and find out where the trouble is, and remedy it just as quickly as possible.

- Q. 45 - Suppose you only had two dynamos, one on the A and the other on the B, and there was on both mains only sufficient load for one dynamo, what would you do to keep all the lights going?
- A. 45 - Put in plenty of resistance in field circuit.
- Q. 46 - Suppose both were fully loaded, what would you do if one dynamo, say on the B side, should break down?
- A. 46 - The fact of having only two dynamos and no spare would imply a small place like Sunbury, which a quick man could run over in about 10 minutes. I should switch the red and blue lines together on good dynamo and run at low E. M. F., and at once send a man round to the different hotels and stores to ask them to turn out half their lamps for the rest of the evening, and when he returns run the dynamo up to proper E. M. F. I should then immediately examine the armature and dynamo that had broke down, and if armature was ruined, telegraph at once for a new one to be sent from headquarters by express.
- Q. 47 - What is the object of the spring at the end of the dynamo?
- A. 47 - The spring at the end of shaft was originally intended to counter-balance the attraction of the field on the iron pulley of armature shaft. In the new B dynamos, a brass pulley is substituted for an iron one. There is, therefore, no necessity for a spring when the dynamo is properly constructed. If the iron core of armature is not set exactly central lengthways in field cavity, on passing a current through dynamo, the field draws very hard on the iron core to get it central, but if the position of armature is properly fixed with regard to field, when the machine is built, there is no need of any end-spring.
- Q. 48 - What causes the shaft to move endwise?
- A. 48 - When the armature is balanced centrally, lengthways in field, it has no tendency to move either way. The inequalities of the belt will, however, produce sufficient end motion to keep an even wear on commutator.
- Q. 49 - What is the object of the brass pulley?
- A. 49 - See Answer 47.
- Q. 50 - What is the object of the track on which the dynamos set, also the object of the screws, and what bad result can be attained in adjusting these screws in an improper manner?
- A. 50 - The tracks are set on a strong wooden frame, and are laid exactly at right angles to engine shaft. On tightening up the screws, the dynamo is forced away from driving pulley on engine, or jackshaft, thus tightening up the belt and providing a ready means of counteracting the effect of the unavoidable stretching of new bolts. As the dynamo can only move on the rails in a straight line away from engine, or driving shaft, it cannot get out of alignment with the same if both screws are used properly, that is, both tightened up alike. If one screw only is run in, a very heavy twisting strain is put on the dynamo and track, which is so obvious that it needs no explanation. Furthermore, if the two screws are put up too hard, so as to make the belt too tight, there will be a heavy friction on both engine and dynamo journals, which will produce heat, and be very injurious to the working parts.

- Q. 51 - How do you tell that a dynamo has made its field?
- A. 51 - By trying it with the nearest piece of iron, such as a wrench, &c.
- Q. 52 - In shutting down the station in the morning explain how you leave all the switches, including the dynamo switches, feeder switches, lightning protector, &c.?
- A. 52 - At shutting down time, first throttle the engine down until lamps are only a bright red, and run this way for about a minute, to give people warning that the light is about to be stopped. Then open switches on head-boards of dynamos, stop the engine and connect the omnibus wires to dead ground, by means of the proper plugs of lightning protector. Leave all other switches, &c., as they are; and, lastly, raise all brushes off commutators.
- Q. 53 - In starting up, what switches do you manipulate and in what order?
- A. 53 - First disconnect omnibus wires from ground, by taking out the plugs of lightning protector, start up engine, and let down brushes on to commutators. The fields will then commence to charge up, but it may be a minute or two before they attain their maximum strength, on account of the extra resistance left in from the night before. As soon as the fields are charged, close the switches on head-boards of dynamos, one after the other, and if lines are all right, the lamps will immediately light. Now step to resistance boxes and work up the pressure on feeders to correct point by the indicators. When starting a plant of two or more dynamos, it cannot be too strongly impressed upon the mind never to close the switch on the head-board of a dynamo until you are absolutely certain, by trial, that the field is charged. Commutators and brushes will be ruined, and armatures burnt out, if this rule is not faithfully attended to.
- Q. 54 - Explain about the pressure the brush should bear on the commutator - the effects of heavy and light pressures?
- A. 54 - When a commutator is polished and brushes in good order, the pressure should be very light, only sufficient to keep the brush against commutator and allow it to conduct the current off without sparking. With a rough commutator, or high bar, a heavier pressure will be found necessary, for the time being, in order to cut down sparking, but the first opportunity must be taken to remedy the fault and lighten up the tension on brushes.
- Q. 55 - Could you put a new rabbit bearing in an H dynamo bearing? How would you do it, how short a time would it take, and what would you do to ascertain that you had a good bearing so you could depend on it for the evening run?
- A. 55 - In the new H dynamos, the Rabbit bearings are made removable and interchangeable. To put in a new bearing, take off pillow-block cap and top bearing, block up armature, unscrew bolts and take out steady pins that secure pillow-block to base plate; slide off pillow-block, take out bottom bearing and put in new one, being careful to see that there is no grit or dirt on it, and also that it fits well and does not rock; slide back pillow-block, put in steady pins, screw down bolts; remove blocking from armature and see that it turns freely in bottom bearing, oiling the same before turning the armature round. Lastly, put on top bearing; replace and screw down cap, not too

tightly at first; try armature again to see that it revolves freely; then put on belt and run it with steam for half an hour to work it down properly. Be careful in blocking up armature that it is supported, at commutator end, on the iron cheek of commutator, and not on copper bars; also, if blocking up on one side only, loosen the cap on other side, or the journals may be strained.

Q. 56 - How deep do you think you could wear down the commutator bars of an H machine safely, and, when you get down to the dangerous point, what would you do?

A. 56 -

Q. 57 - Suppose you had started up a dynamo for a week every night; it made its field all right and then you connected it to the mains. Now suppose one night you started it up and it would not make its field, what would you do, and how would you be certain, if you did succeed in causing it to make its own field, that it had the same polarity as before, also please explain the probable causes of the failure to make its own field?

A. 57 - Carefully examine all the field connections to see that none of them are loose or altered; then see that the shunt wire on head board is all right, and follow back the wire that runs to resis. box, and also the other wire from resis. to one of the omnibus wires. If everything appears right and the field still refuses to charge up, short-circuit resis. box by putting a No. 16 copper wire across the two binding posts of same. If field still refuses to charge up, disconnect each leg of field and proceed to test them separately with battery and galvanometer, to see if there is a break in the wire coiled around them. Go over all this work very carefully, and if nothing wrong can be found, connect up everything about the field as it was at first, but leave it disconnected from the main wires from brushes. Now start up the other dynamo, and bring an insulated No. 16 wire from its positive pole to the left hand field binding post, and another wire of the same sort from the negative pole of the other dynamo to the right hand field binding post. If connections of field are all right this will charge up the field in the right direction. If the field charges up disconnect from the other dynamo, and put all connections back as they were at first, and if the dynamo still refuses to work up its own field, the fault must lie in the armature. In writing of right and left field binding post, it is to be understood that the person viewing them is standing with his face to head-board of dynamo. Furthermore, the right and left refers only to the new H dynamo that has its field binding posts in the centre of head board. (See sketch on p. )  
If using an old style L or K dynamo where the field binding posts are on outside of head board the terms right and left must be reversed. Dynamos of all types, whether old or new styles, should be charged so that the right hand pole-piece (standing facing switch board) shall attract the north-seeking end of a magnetic needle, and the left hand pole-piece should attract the other end. This is not necessary, as far as the working of a single dynamo is concerned, but for the sake of uniformity and order in connecting together two or

more it is an essential rule. When dynamos are charged according to above directions, the down-brush will always be found to be positive. To test which is the positive brush, make a solution of half an ounce of iodide of potassium in four ounces of clean water and damp a piece of white blotting paper with the solution, connect a piece of wire to each brush-holder of dynamo, and bring the other two ends of the wires on to the damp blotting paper, keeping them about two inches apart from one another. The wire that is attached to the positive brush-holder will make a brown stain on the paper; the negative wire will make no mark.

- Q. 58 - Suppose one of the bearings of one of the dynamos persisted in getting very hot every night, even after a week's running, and this required a great deal of watching, would you let this continue or what would you do to prevent its recurrence?
- A. 58 - This might be due to a badly-scraped bearing. To find out, block up armature and take off bearing and examine it, and if necessary, re-scrape it to touch shaft all over. It might also be caused by a bent shaft. The armature shaft might possibly have been bent in shipping or packing. If armature shaft is found to be sprung order a new armature.
- Q. 59 - Explain the nature and use of feeders?
- A. 59 - Feeders are copper conductors connected to the omnibus wires, and stretching away from the central station in various directions over the district to be supplied with light. They are so calculated with respect to size, length and position as to maintain a certain electrical pressure at all parts of the district where they are connected to the mains. In order to produce this result of even pressure at these various points, they are often connected together by bridge wires, so that they form a sort of net-work of conductors.
- Q. 60 - Explain the difference between a main and a feeder?
- A. 60 - The mains are copper conductors that are connected to the ends of the feeders, and at the points of connection iron wires are attached, called pressure wires. These are carried back on the poles to central station and terminate in instruments called pressure indicators, which have been before described, and by observing the readings of these instruments the exact E. M. F. existing at the end of feeders can be taken.
- Q. 61 - Explain why lamps are never connected to feeders?
- A. 61 - There is usually allowed a drop of 10 per cent. in the E. M. F. between dynamos and end of feeders. It is therefore evident that no other connection can be allowed on a feeder, excepting to a main at the end of it, for were a main or a service taken from any intervening place or places the current flowing into that main or service would be variable in proportion to the distance from central station, at which the tap was taken. Suppose, for example, the E. M. F. at station were 100 volts, and that a drop of 10 per cent. was calculated for the feeders. It is evident that 90 per cent. of original E. M. F. is only available at end of feeders, but if the feeder was tapped for a service wire, half way between central station and end of feeder, there would be 95 per cent. of original E. M. F. delivered at this point to the service in question, in consequence of which the lamps at the end of service would be raised much above their normal candle power, and their lives would be considerably shortened. Therefore, for these reasons, the mains only can be connected to the feeders, but from the mains, at any

point, services may be run to supply the lamps used in stores, houses, &c.

- Q. 62 - Explain the object of the central wire in the 3 wire system?  
 A. 62 - The third, or compensating wire, serves two purposes in the system:  
 (I.) It serves to keep the E. M. F. even on both sides of the system when the number of lamps on both sides is different.  
 (II.) It serves in many places as a separate and independent conductor between different consumers.

In this manner:

- (I.) When the red, or positive side of system, is carrying the heaviest load of lamps, the compensating wire becomes blue, or negative, and carries back to the red dynamo the surplus current. When the blue, or negative side, is carrying the heaviest load of lamps, the compensating wire becomes a positive conductor, and carries the excess of current required from the positive pole of blue dynamo to the lamps in question.  
 (II.) Supposing there are two houses in a street, and they are 20 yards apart. Each house has, say, 10 lamps installed. One house is connected to the red side and the other to the blue side of mains. The 10 lamps in both houses, being all burning, the current will enter on the red service, pass through the lamps to the black service, along compensating wire to black service of next house, through lamps and back to blue or negative main. Thus it will be seen once more that to the red or positive main, the compensating wire is blue or negative and to the blue main the compensating wire is red or positive. (This is not the place to enter into the technical subject as to whether or not the current really flows. I simply assume that it does so for convenience of expression.)

- Q. 63 - How would you tell that there are more lamps on the B side than on the A?  
 A. 63 - By observing the ampere meter.  
 Q. 64 - What would be the result if there were an equal number of lamps on the A and B sides, and the central or compensating wire of all the feeders were disconnected from the wire between the A and B dynamos, also the effect if there were twice as many lamps on the B side as on the A?  
 A. 64 - In the case of there being an equal number of lamps on each side, there would be no current passing either way on black omnibus wire, therefore it would make no difference to lamps if it were connected or not. In the case of there being twice as many lamps on the B side as on the A, if black omnibus wire were disconnected, the lamps on B side would sink to a low candle power, whilst the lamps on A side would rise to a high incandescence, and many of them would break.  
 Q. 65 - What is the object of a house changing switch?  
 A. 65 - If A and B sides are unequally loaded, by throwing over on to the low side one or more heavy consumers, by means of the house-changing switch, a more even balance may be effected.



- Q. 66 - Suppose the station was loaded up with the full compliment of customers, and it was found that every night the B side had more lights than the A, what would you do?
- A. 66 - Throw over permanently (by means of house-changing switches) a sufficient number of heavy consumers to make the balance equal.
- Q. 67 - How would you select the customers so as to produce an even balance and yet not have uneven pressures?
- A. 67 - Select such customers as are known to close at certain hours, such as stores, offices, &c., and divide them up as evenly as possible (according to the number of lamps that each one burns) on the red and blue sides.
- Q. 68 - How would you tell, even supposing that there were an even balance between the number of lamps on the A and B side as a whole, that there is an unequal balance in different parts of the town?
- A. 68 - By reading the pressure indicators.
- Q. 69 - Supposing you were to cut in 20 customers of 10 lights each, and a theatre of 200 lights, and most of the customers did not use the light after, say 9:30, how would you arrange the whole number of lights so as to prevent a bad throwing out of the balance?
- A. 69 - Divide up the 20 customers as evenly as possible between the two sides, and carry three wires into the theatre, distributing the lamps between them.
- Q. 70 - What is the object of safety-catches at the feeder indicator wires where they connect with the ends of the feeders at the mains, also the safety-catches in the feeders and mains?
- A. 70 - In case of a wire falling across pressure wires a safety-catch placed at the connection of such to the feeders, would burn out and prevent a permanent short circuit. Safety-catches on mains and feeders serve for the same purpose, and they will furthermore designate by the extinction of lamps the locality of short circuit, and thus save trouble in hunting for the same.
- Q. 71 - Supposing, while running, a cross occurred, and a boy came to the station and stated that all the lights on two blocks were out, what would you do?
- A. 71 - Send down a man to hunt up the cross, get rid of it, and renew the safety catches.
- Q. 72 - What would be the effect on the record of the meters if you should throw both the B and A over on one dynamo?
- A. 72 - If the dynamo on red side was kept running, and the red and blue lines thrown together, all the meters on the blue side would be reversed, but if the dynamo on blue side were kept running, and the same thing done, all the meters on the red side would be reversed.
- Q. 73 - Suppose you had the lightning protector connected and one side of the resistance got very much hotter than the other, what would be the probable causes?
- A. 73 - Some of the coils of wire in hot resistance might be short-circuited, cutting down the resistance, which would allow more current to pass, and more heat would be developed.

- Q. 74 - What is meant when it is said a lamp aro'd?
- A. 74 - The current, instead of passing wholly around carbon loop, jumps from one copper connection to the other.
- Q. 75 - Have you ever connected the wires to a socket?
- A. 75 -
- Q. 76 - Suppose one of the wire bands on a dynamo came loose and the wire got tangled in the field, would you stop? If so, what would you do to start again?
- A. 76 - Stop instantly. Throw off belt. Turn armature slowly and find loose end of wire. Unwind as much as is loose, and cut off close with a pair of sharp nippers. Then examine well to see that no more ends are loose, and start up again.
- Q. 77 - Suppose you had an H armature turn out on the B side, so you had to stop and had a spare armature, explain what you would do to get it in the machine and start up as quick as possible?
- A. 77 - Take out necessary screws and bolts to loosen field block on most convenient side. Slide off the field block and half of the zinc plate together on some wooden blocking. This will allow the armature to be taken out sideways, by first blocking it up, then taking out bolts and steady pins of pillow blocks, and sliding them off from shaft. Get in spare armature by a reversal of this process, and start up slowly to see that all is right.
- Q. 78 - Why is it necessary to lift the brushes away from the commutator when you stop the machine and before you start up?
- A. 78 -
- Q. 79 - When a person wants the light what do you do before and after he has our light to ascertain that our bill will be more or less than his gas bills, or that he burns more or less of our lights than he did gas?
- A. 79 - Ascertain the number of gas-burners he uses, and as nearly as possible his hours of burning. Then see that he has no more electric lamps than he had gas-burners, and that he does not use them for a longer time every night.
- Q. 80 - Is it or is it not possible to set the brushes, as regards position and pressure, as to cause the commutator to polish instead of cutting?
- A. 80 - By careful attention to commutator and brushes, it is quite possible to get them to run without any perceptible spark, in which case the commutator will glaze over instead of getting rough, and work in this way, it will wear for almost an indefinite time.

QUESTIONS AND ANSWERS RELATIVE TO RUNNING OF  
ENGINE AND BOILER.

- Q. 1 - If with ordinary boiler having 100 lbs. pressure, how many inches higher will water stand in the gauge than it would without pressure in boiler?
- A. 1 - About 1/2 an inch. When you start engine, water goes 1/2 inch higher. First, due to expansion of water; second, to effect of steam disengagement.
- Q. 2 - How do you clean the water gauge?
- A. 2 - Blow it out is one way, take apart and clean is another way. Locks are provided to blow it out and also to disconnect.
- Q. 3 - If crank pin got hot, and you did not want to stop, what would you do, also what would you do to always have a convenient remedy at hand?
- Q. 4 - How would you apply water to the crank pin, so you could attend to your other duties?
- A. 3 and 4 - Use cold water through hose, permanent piping over bearing with cock is best to use; as this is liable to occur from carelessness, a little oil must be used at times, as water goes through.
- Q. 5 - What is the cause generally of crank pin heating?
- A. 5 - Want of proper lubrication, boxes too tight, not allowing enough room for the expansion, due to the normal heating, due to load; crank pin not true, want of alignment, bad oil, grit in oil, too loose pounding.
- Q. 6 - If you were running your engine, and it had been going for, say, half an hour, and then suddenly commenced to thump in cylinder, and you had reason to believe you had dry steam, what would you attribute the thumping to?
- A. 6 - Rings on piston binding and jumping from want of oil, due to oil feed not working, not cushion enough.
- Q. 7 - What harm does it do to allow the crank pin connection to rattle or thump?
- A. 7 - Looseness of parts will soon strip keys, or bolts. Permit the piston to strike cylinder head, damage crank. Loose fit prevents good lubrication, on the other hand there should be a slight pounding, just enough to convey to the ear the fact that the boxes are not too tight, and thus prevent the necessity of constantly feeling the bearing to ascertain if it is heating.
- Q. 8 - Name all the causes which will produce a pounding or rattle in an engine?
- A. 8 -
- Q. 9 - What causes a boiler to foam, and what would you do to stop it?

- A. 9 - Too little steam room; crowding boiler; water lifts by engine taking steam too rapidly; oil in water, salt water.
- A. 10 - Is it better to carry high or low water?
- A. 10 - Low water. It gives more steam room, the steam is freed easier, and is essential where dry steam is required, as with the Armington engine.
- Q. 11 - What is good firing and bad firing of a boiler?
- A. 11 - A uniform bed of fire, uniformly bright and thin, with no holes, coal thrown quickly and evenly, and door closed quickly, bad firing is just the opposite.
- Q. 12 - How much waste of coal is there in banking the fires of a 50 h.p. boiler for 10 hours, and how do you bank a fire?
- A. 12 - About 1/5 of what is left after shutting down.
- Q. 13 - Suppose you wanted to start an Armington engine, and she turned over hard, and you had to do it yourself, how would you do it?
- A. 13 - Open the cocks, warm the cylinder, then shut off nearly all the steam and try and turn her over, if it don't start add little more steam, then try and turn over - never open throttle so wide that when you turn her over she will start off with great rapidity, otherwise the sudden in-rush of steam might carry condensed water from the steam piping into the cylinder to a greater extent than can pass through the cocks, when the cylinder head will be blown off. Some persons get engine crank at right point, warm cylinder, suddenly open throttle and then quickly close it, and then open slowly to keep her in motion.
- Q. 14 - What causes a boiler tube to burn out?
- A. 14 - Bad metal, low water permits it to become red hot, thick incrustation preventing water receiving heat quickly enough, sulphur in the coal.
- Q. 15 - What do you think is the best method of feeding water to a boiler, injector or pump; if one or the other, why?
- A. 15 - Pump, because you can graduate your feed so that you can cause a constant flow of water to the boiler.
- Q. 16 - What is the disadvantage of sooty water tubes; how are they cleaned, and how often should they be cleaned?
- A. 16 - They cause a great loss by preventing heat from coming in contact with the tube, a thick coating will in some cases cause a loss of 20 per cent. of the coal. A steam jet is the most convenient thing to clean them; if jet is used, inspection will determine when to clean.
- Q. 17 - Suppose you had regular boiler pressure, a thin even fire, and the engine was doing very little, when suddenly a large load came on, what would you do in connection with preparing the boiler to supply the steam, you having no blower?
- A. 17 - Stir the fire quickly, let the water go low, in a minute or so add quickly coal, at intervals, closing door quickly, open dampers, &c.
- Q. 18 - How often would you blow off the boiler, running say, up to the capacity of the boiler for three hours, and half the capacity for seven hours, you having no heater?
- A. 18 - It depends on water. If water bad, flush up and blow twice a day, and once a month completely.

- Q. 19 - What is the benefit of a feed-water heater; what gain in economy; name all the benefits?
- A. 19 - It utilizes waste heat of the exhaust steam and puts hot water into boiler instead of cold, this increases boiler capacity, also prevents to great extent incrustation of boiler tubes.
- Q. 20 - How much efficiency in a 50 H.P. boiler (clean) is lost by one-sixteenth of an inch incrustation within the tube?
- A. 20 - From 13 to 15 per cent.
- Q. 21 - What is Rabbitt metal, and give the proportions?
- A. 21 - Copper, 5.7; tin, 89; antimony, 7.3.  
Nyström says, tin, 25, antimony, 2; copper, 0.5.
- Q. 22 - Suppose the bearings of an 8½ x 10 engine (Armington) should get so hot as to melt the babbitt, how would you proceed to get a new bearing ready in a few hours?
- A. 22 - Have pot with metal ready beforehand. Lift out shaft immediately; take out metal and pour bearing as soon as possible.
- Q. 23 - Can you put a new fire tube in a Babcock boiler; how would you do it quickly if you had it on hand?
- A. 23 - Lower the water below the tube; cut the old one out, and put the new one in and expand it.
- Q. 24 - How would you clean the scale from the inside of a Babcock tube, what tools are necessary?
- A. 24 -
- Q. 25 - Supposing you had been running an Armington engine for, say, 2 months, and knew that a very small amount of water in the cylinder would knock off the cylinder head, and this accident occurred to you, what would you attribute the accident to?
- A. 25 - Carelessness in not warming up cylinder to prevent condensation, and not leaving cocks open long enough to clear the steam pipes of condensed water.
- Q. 26 - After running engines a month, and had everything worn down to bearing, explain how you would ascertain the minimum amount of oil you could safely use?
- A. 26 - By experiment, determining the amount of oil and watching for the critical point; a little excess is best.
- Q. 27 - What is principle of the automatic oilers?
- A. 27 - Condensation of steam into water; the specific gravity of water being greater than oil forces the oil in drops into the cylinder.
- Q. 28 - Explain how the automatic oiler works, and what you do to start it?
- A. 28 -

- Q. 29 - How long before lighting is necessary, would you advise the starting up of the engine?
- A. 29 - Engines should be started up gradually and warmed up, freed of all water, all bearings under right condition of lubrication, and run for 5 or 10 minutes before putting on load.
- Q. 30 - Suppose you ran short of cylinder oil and journals oil, what oil would you use for the cylinder and bearings?
- A. 30 - Spem oil; clear heavy mineral oil; tallow.
- Q. 31 - Make a diagram, and explain the Armington & Sims' governor?
- A. 31 -
- Q. 32 - How do you tell that a belt is slipping?
- A. 32 - By glazed surface on belt, by squeaking, by heat of pulley over which it slips, by calculation and noticing position after a given number of revolutions.
- Q. 33 - Suppose you had a 6 inch single belt conveying 10 H.P., and running 2,000 feet per minute, how would you convey the same horse power with the same strain on the belt when it was only 3 inches wide?
- A. 33 - By running 4,000 feet a minute.
- Q. 34 - Explain the method of regenerating oil which has once been used?
- A. 34 -
- Q. 35 - How often would you examine inside of steam chest and cylinder, also crank pin bearing?
- A. 35 - Once or twice a month, and crank pin oftener if there has been much pounding.
- Q. 36 - What is the cause of hammering in some of the throttle valves used for giving and shutting off steam in engine, and how would you stop the hammering?
- A. 36 - Poor valve seat; poor connection; water lodging in some pipe connection, it moves about by passage of steam over it.
- Q. 37 - With a given load how would you prevent the governor from controlling the engine?

- A. 37 - By adjusting the springs on the Armington engine.
- Q. 38 - Suppose your engine run for a month at 350, with throttle open and full load, then it gradually, from day to day, went slower, say, 340, 335, etc., what would you do to cause the engine to run at the right speed, and what would be the cause of the slowing down in speed?
- A. 38 - The spring would have taken a permanent set.
- Q. 39 - Suppose the engine had a constant load and was running 350, then, without any change of load, it ran to 365, then down to 335, and kept this up every evening, what is the cause, and what would you do?
- A. 39 - A binding in the eccentric strap, or parts of governor or valve, or rocker arm.
- Q. 40 - How would you tighten a nut if you had no wrench of any kind?
- A. 40 - Use chisel and hammer.
- Q. 41 - If for some reason the water in the boiler got very low and below the gauges, and you didn't know where it was, what would you do?
- A. 41 - Pull the fires; then pump up.
- Q. 42 - In setting valve in an Armington engine, what load would you give it?
- A. 42 - No load.
- Q. 43 - How often should the safety valve of a boiler be tested?
- A. 43 - Once a day.
- Q. 44 - Suppose a leak occurred around one of the rivets of the steam drum, what would you do?
- A. 44 - Caulk it.
- Q. 45 - Is it best to caulk a leaky rivet in a boiler when cold or hot?
- A. 45 - Hot.
- Q. 46 - Why should an eccentric strap get hot when it has very little work to do, while a bearing, doing 500 times more work, will run cool?
- A. 46 - Bad Workmanship.
- Q. 47 - What causes grate bars to burn out?
- A. 47 - Too heavy a fire; heavy load clinkers; sulphur in coal.
- Q. 48 - If the slides of the engine should get out, what would be the probable cause, and how would you remedy it?
- A. 48 - Top cap too tight; want of oil; grit in oil; scrape the bearings and readjust.
- Q. 49 - Suppose they got cutting badly while running, and you couldn't stop, what would you do?
- A. 49 - Loosen top slides quickly.
- Q. 50 - Should the throttle on Armington engine be partly closed or wide open when engine is running with no load?
- A. 50 - Always wide open.
- Q. 51 - Suppose engine slacks up too much from heavy load, what are causes, and what would you do?
- A. 51 - Increase the boiler pressure.

Q. 52 - From what part of a boiler is it best to take steam for an injector?  
A. 52 -

Q. 53 - What is the inside of an ordinary steam gauge like; explain by sketch?  
A. 53 -

Q. 54 - Why are pulleys turned higher on the centre of their face?  
A. 54 - To keep the belt on, a belt always runs to the highest point on a pulley.

Q. 55 - Suppose an engine cutting off a  $1/4$  stroke with 100 lbs. of steam gave 25 indicated horse power, and you wanted 50 horse power, what is to be done?

A. 55 - Double the speed of the engine, or double the boiler pressure.

Q. 56 - What is the difference in cylinder and journal oil?

A. 56 - Cylinder oil must have more body, and should be of mineral origin.

Q. 57 - What is an indicator and what does a diagram show and mean; make sketch?

A. 57 -

Q. 58 - Suppose you run from 5 P.M. until 2:30 A.M., would you bank fire or start fresh fires every day?

A. 58 - Start fresh fire.

Q. 59 - Suppose you run from 5 P.M. till 6 A.M., would you do any different about banking fires?

A. 59 - Bank the fire.



## INSTRUCTIONS

By T. A. Edison

Before a consumer is connected, ascertain by passing his place at least every half hour, the exact number of jets actually burning until he closes; from this his gas bill can be almost exactly calculated. Sometimes it will be possible to read his gas meter, keeping the time of each jet actually burning, for, say 20 minutes, and thus ascertain. It is highly important to obtain the total number of gas jets, and their hours of burning, and then when the electric light is connected, the same information as to the hours of burning must be obtained, and if it is found that the consumer is using a greater number of jets, or burning the same number longer, or fails to economize by not turning some jets off when near closing up time, or asks for a higher candle power lamp, or does anything that would tend to cause his bill to be greater than his gas bill, he should be notified at once, and explanations made that his bill will be higher, and to what extent, so when the bill is presented at the end of the month he knows what to expect, otherwise his ignorance will cause him to use more light, and then quarrel over the bill, and perhaps refuse to pay. It will also produce an impression on his mind that the electric light is more costly than gas, whereas, in truth, it might be as cheap, if not cheaper.

To make comparisons, the light must be burnt on the same basis as gas, light for light, hour for hour, and both about the same power. Suppose a customer had been burning 10 lights, each equal to 10 candle power electric, and he had been paying 1 3/4¢ per hour for each gas jet, or 1 4/10 mills per candle, per hour, for 3 hours per night, for 25 days, his bill would be \$13.65. Suppose he puts in an equal number of 10 candle power electric lamps at 1 1/4¢ per hour, his bill for corresponding period would be \$9.75. Now suppose he wanted 16 candle power lamps, and we put them in without making him understand that it would cost him more than the same number of gas jets, because the 16 c.p. lamps were more powerful, then his bill would be \$13.52, the same as gas, he would compare his gas bill, and would then firmly believe that our light was no cheaper than gas, for the reason that in most cases customers cannot make a comparison as to the amount of light, while with his bills he is perfectly competent to compare. Some customers on making a change from gas to electric lamps, put in more electric jets than they previously had gas jets. Before the month is over, and when bill comes in, they generally forget that they are using a greater number of electric lights than they previously used gas jets, and most of them will swear to it, stick to it, and actually believe it, because the fact of adding two or three jets is so small a matter that it does not impress itself on their memory. The consequence is that the bill is more than the corresponding gas bill of last year, or the amount which they should save over gas is lost, and the consequence is that this impression is never eradicated, and the consumer is dissatisfied, while if he were notified, within two or three nights after he had the premises connected, of the fact that he had two or three more electric lamps than he previously had gas, and that his bill would be increased to that extent, he would be warned and led to expect the increase, and this impression would be maintained for all future time.

In private houses it is impossible to walk past every 30 minutes and jot down the lights; in this case, the explanations as to cost, light, &c., should be very full to the owner. Unless these instructions are carried out, 75 per cent. of the consumers will be dissatisfied, many will have it dis-

continued, or not use it, although it may actually be cheaper, and the business will be an up-hill one.

All the mistakes mentioned have been made at the New York Station, where this experience has been gained in dealing with the public, and the remedies here mentioned have been found to work perfectly in every case, so that all new consumers are perfectly satisfied that they are getting just what we represented they would get.

In no case, unless it is extremely exceptional, should wiring be done at the company's expense, in order to gain a customer after the station is well started. It is always best that the company do no wiring themselves, but turn the order over to regular authorized wiring company or individual who will give estimates, and do the wiring promptly and in a proper manner. If in small towns the company does the wiring itself, it would be necessary to obtain an expert, the bill would be presented by the company and the customer would in most cases use the threat that he would stop using the light rather than pay his wiring bill, in order to coerce the company to either give him the wiring free or to cut down the bill, thus making a loss to the company. On the other hand, the private company, or individual who does the wiring have no difficulty in collecting their bills, as the customer has no excuse, or means of coercion.

In small towns, from 2,000 to 20,000 inhabitants, after the station has been started and three or four prominent places are lighted, stop soliciting orders for light, but run along quietly and wait. The customers will gradually come in and ask to be connected; their judgment and desires having been gained by seeing the light in the prominent places. Customers obtained in this manner give no trouble, and in time 75 per cent. of the whole number counted upon to take the light, will ask of their own accord to be connected. After this result is obtained soliciting will be beneficial, the parties who do not order of their own accord are laboring under a misconception as to cost of light or wiring, or require a little urging.

In nearly every instance, except with the best concerns, parties will prevaricate as to the amount of their gas bills. Many will mentally halve the amount. In many cases customers will produce their gas bills when the electric light bill is much larger, and it is certain that they have burned about the same number of jets and hours. When this occurs, investigation has proved that their gas meter is wrong and has registered too slow. In small towns the gas meters, as well as the management of the gas company, is wretched. There will be many anomalous bills that will cause a great deal of trouble.

Sometimes the gas bill is small by reason of the fact that the parties are using small burners. If the burner is found to be small, and not to give nearly as much light as the regular electric, the fact should be shown to the proposed customer, and the suggestion made that if he wants to keep his bill the same he should put in less electric, or if he wants more light, the same number, explaining that the electric will run his bill up in comparison, by reason of the fact that he is using very small gas burners. In placing a meter always try to put it in a place where it will be convenient to remove or replace the bottles, and inexpensive to place in position, and where boys and others will not be liable to tamper with it. It is also important to select a place where the liquids in the bottles will not be liable to freeze.

When the station is first started and 2 or 3 consumers are connected, it is not actually necessary (unless it can be done conveniently) to put the meters in these 2 or 3 places. They should, however, be put in at once if

ready, but thereafter no consumer should be connected, so that he can obtain light, unless his meter is in position and ready to record. For the first month a record should be taken every 15 days and bill should be presented. After the first month, the taking a meter reading every month will be sufficient. The object of taking it twice during the first month is to allow the consumer to see what it costs so that he may be able to answer the enquiries of others, who hesitate until they can ascertain from their neighbors what their bill is and how it compares with gas.

Do not take any customers who close at 6 o'clock, or even 7 o'clock, no matter how many lights they may burn, or how high their gas bill may be. Early closers are not desirable customers, although to a person not versed in electric lighting a store burning three times as many jets as any other concern in town, or a large factory closing at 6 or 7 P.M., would be thought to be very desirable. This is not the case, for the reason that in the winter, for every light burning between 5 and 6 P.M. there must be invested from \$15 to \$25 in apparatus at the Central Station and wires in the street. Hence, if a store which closes at 6 P.M. in December had 100 lights, it would require an investment of say \$2,000, and 100 lamps burning for 1 hour only, at 1 1/4 cents per hour, would amount to \$1.25 per day. There are only about 130 nights in the year that any light would be required in a store closing at 6 P.M. and the whole lighting would not amount to over 100 full hours, which, at \$1.25 per hour, would amount to \$125, whereas if these 100 lights were sold to various parties who closed at from 9 to 11 P.M., the average would be 3 hours of actual burning the year round, Sundays excepted; hence 312 days in the year and 100 lamps, at \$1.25 per hour, would give \$3.75 per day, or \$1,170 per annum for \$2,000 invested, as against \$125 from the single consumer, who closes at 6 P.M. The latter consumer would not be desirable if he kept open until 10 P.M. only Saturday night.

Factories that work late or all night are very desirable, but these factories that generally close at 6 P.M., but sometimes, when business is good, work nights, are not desirable. Whenever possible the local company should endeavor to sell an isolated plant to the factory, from which the company would derive a profit, both from the original sale and from the continuous sale of lamps to the purchaser.

Private houses are very desirable, owing to the superior effects and beauty and quality of the light, which gives it a greater advantage in this connection than in a store.

When it is once installed in a private house parties will not discard it, even if the price were to be placed far above gas.

Where it is possible get the consumer to purchase permanent electric light fixtures from the manufacturers. They will then have made an investment, and will be more likely to pay their bills promptly.

The mains and poles should be inspected every two or three days. Any moving of buildings, rebuilding, or any changes liable to be made, should be noted and our poles and wires removed or changed sometime before the actual necessity occurs.

In this business, where no stoppage of the light must occur under any consideration, the person in charge must look ahead for danger, or changes going on in the town likely even by chance to produce an interruption.

In the same way, the moment defects in the apparatus, engine, boilers, or

anything which is likely to cause a stoppage in the future, is noticed, it must be remedied at once, or means provided, so that when trouble does occur, it will not cause the stoppage of light for an instant.

There should be at least four or five days' supply of coal on hand in case of a snow storm that might render cartage impossible. The water supply also should be looked after in time, so that there shall be no sudden lack of water by failing of the source of supply, stoppage of supply pipe, freezing, &c. Stations running only at night should start engine and put pressure on mains 30 minutes before the necessity occurs for lighting up the darkest part of stores. This may occur sooner than expected in some cases, by reason of a storm.

Lamps are furnished to the consumer free. An account of the lamps supplied to each person should be kept and also of the number of broken ones returned.

Always obtain the broken lamp for every new one furnished. When the consumer is connected inform him that any lamps missing, or broken by carelessness, must be paid for at \$1.00 each.

In a place where they burn from 15 to 50 lamps furnish 1 dozen extra; from 6 to 15 lamps, furnish 1/2 dozen extra; and from 1 to 6, 3 extra lamps, over and above those in the sockets.

In all cases when a stock of lamps is replenished be careful to bring away as many broken ones as new ones supplied, and if any are missing notify the consumer that they will be charged on his next bill.

If they are not properly charged people will get careless and the lamp account will get mixed.

In lighting up a store, &c., where the ceiling is low, and the walls and ceiling white, it is best to put the lamps upright, and use no shade. This cheapens the installation, the white walls acting as a reflector.

Where the walls and ceiling are white, but very high, a shade may be used, the lamps being placed upright, but where the ceiling is dark, the best position for the lamps is pendant, shade being also used. A row can be lighted with one-third less jets when placed in the centre than when placed on brackets near the wall. In many stores in country towns, especially the inferior ones, the ceilings are so low that no chandeliers are required, the sockets and shades being connected direct on the ceiling.

### Central Station Engineering Plans

This volume contains engineering plans and information used in determining the construction plan and the cost of various central stations. Included is information about the number of lamps and their candle power and about the type, size, and dimension of the building intended to house the central station. A floor plan of the building and miscellaneous other information about the prospective central station are also included. The Construction Department's mapping and determination department probably extracted this data from reports submitted by canvassers. The book contains 192 numbered pages. Only 16 pages have been used.

54 FIRST CAPACITY OF STATION	SIZE OF LOT TO START STATION.	BRICK OR FRAME		CENTRAL STATION ENGINEERING PLANS STATIONS AT	No. of trac-ings.	NUMBER OF TRACINGS	BLUE PRINTS	WHEN SENT OUT TO WHOM	BY WHOM	55 UNRECORDED
Lamps	CP.									
				SHAMOKIN.	1-1A	2				
				BROCKTON	2-2A-3-4	4				
				LAWRENCE	5-5A-5A or 2 et 1/2	2				
				EVANSVILLE	7	1				
				SUNBURY	8	1				
				CHARLESTON	9	1				
				LOWELL	11-11B-11C.	1				
				GOVERNORS ISD	12					
				LLEWELLYN PARK	13					
				P. R. R. DEPOT.	14A-14B-14C 14A-14B-14C					
				ST. LOUIS	15					
				FALL RIVER	16					
				CANYON ARKANSAS	17					
				UTICA	18					
				WATSON TOWN	19	2				

56 FIRST CAPACITY  
OF

STATION

Lamps C.P.

SIZE OF LOT

TO

BRICK

OR

START STATION FRAME

CENTRAL STATION  
ENGINEERING PLANS  
STATIONS

AT

BY TRACING

NUMBER  
OF SKETCHES

BLUE PRINTS

W/IN NORTH

TO W/IN

BY W/IN

W/IN RETURN

57

ERIE

20

21

22

23

HARTFORD

24

25

26

27

28

29

30

31

32

33

MIDDLETOWN

34

CENTRAL STATION  
 ENGINEERING PLANS  
 STATIONS  
 AT

SOUTHINGTON

35

36

37

38

Newark

39

40

41

42

43

44

PIQUA

45

46

47

MENDOTA

48

49

STATIONS	NO. ON TRACINGS	NUMBER TRACINGS	EXPLANATION	TO WHOM	BY WHOM	REMARKS
SOUTHINGTON	35					
	36					
	37					
	38					
Newark	39					
	40					
	41					
	42					
	43					
	44					
PIQUA	45					
	46					
	47					
MENDOTA	48					
	49					



NEWBURGH

TIFFIN

50

51

52

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## ESTIMATE NUMBERS

ESTIMATE N<sup>os</sup>

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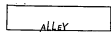
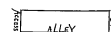
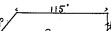
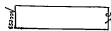
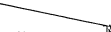
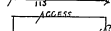
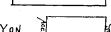
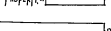
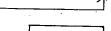
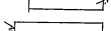

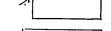
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N <sup>o</sup> .	N <sup>o</sup> LAMPS	C.P.	KIND Bldg.	REMARKS	SIZE OF Bldg.	PLAN OF BUILDING
1	3200	10	B	SPARE 1-800	25' x 124'	
1A	1600	10	B	SPARE 1-800	25' x 80.9'	
2	1600	10	B	To INCREASE TO 8000 LAMPS. SPARE 1-800	50' x 137'	
3	8000	10	B	SPARE 1-800	50' x 137'	SAME AS ABOVE
4	1600	10	B	To INCREASE TO 3200 LAMPS. SPARE 1-800	33' x 89'	
5	3200	10	B	SPARE 1-800	33' x 89'	SAME AS ABOVE
6	4800	10	B	To INCREASE TO 9600 or decrease to 4800 DYNAMOS. SPARE 1-800	50' x 97'	
7	4800	10	B	SPARE 1-800	50' x 97'	
8	500	10	F	No SPARE	25' x 54'	Access to rear of ALLEY on property
9	1600	16	B	Access to Boiler room	25' x 107.5'	
10	500	10	F	Under DYNAMO room	26' x 40'	
11	3200	10	B	To INCREASE TO 4800 LAMPS. SPARE 1-800	50' x 75'	
12	1600	10	B	SPARE	38.6' x 48.9'	
13	1000	10	B	No SPARE	38.6' x 53.9'	
14				S.P.R.R.		

## ESTIMATE NUMBERS

15,

16A

18,

56,

56 SPECIAL

24,

34,

34A, 34B, 45, 45A, 45B

35,

48A, 48

N <sup>o</sup>	N <sup>o</sup> LAMPS	C.P.	N <sup>o</sup> BLOG	REMARKS	SIZE OF BLOG	PLAN OF BUILDING
15	9600	10	B	DYNAMOS BELTED FROM EPIGLINES BELOW	23 x 128.9'	
16	1600	10	B	To INCREASE TO 4800 SPARE 2-400	37 1/2 x 79.3'	
17				SP. CAPION APPL. PLAS		
18	3200	10	B	SPARE 1-800		
19	500	10	B	To INCREASE TO 6400 No SPARE	47 x 90 36 x 38.9'	
20	1600	10	B	To INCREASE TO 3200	42 x 56.10	
21	1000	10	B	SPARE 2-400		
21A	1000	10	B	No SPARE - To INCREASE TO 3200 BY INCREASING OFFICE SP. STAIRS	40 x 60 40 x 60	
22	4800	10	B	To INCREASE TO 6400 SPARE 1-800		
23	500	10	F	No SPARE	31 x 35'	
24	3200	10	B	To INCREASE TO 9600 BY PUTTING DYNAMOS ON STAIRS - SPARE 1-800	50 x 90	
25	500	10	B	No SPARE	28.5' x 52.8'	
26	800	10	F	No SPARE - To INCREASE TO 1600 BY CHANGING DYNAMOS TO ADDING SPARE 1-H	30 x 87	
27	600	10	F	No SPARE	31 x 34.9"	
28	1600	10	B	SPARE 2-400	33.6' x 73	
29	500	10	F	No SPARE	23.6' x 38'	

## ESTIMATE NUMBERS

52A

52A

28, 35A, 39, 31-72, 54.

52, 44, 44A, 44B

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38 40.

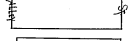
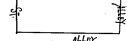
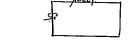
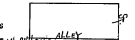
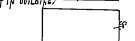
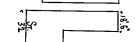
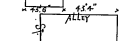

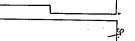
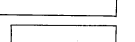
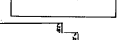
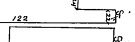
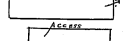


50

50

73 45E, 34, 45F, 60.

23

23

N <sup>o</sup>	N <sup>o</sup> LAMPS	C.P.	KIND BLDG.	REMARKS	SIZE OF BLDG.	PLAN of BUILDING.
30	1600	10	B	SPARE TWO-400 To increase to 3200 of addition of 32 to spare of building	25x81	
31	1600	10	B	SPARE 2-400 To increase to 3200 of addition of 32 to spare of building	25x80	
32	1000	10	F	No SPARE	34x37.3	
33	1600	10	B	To increase to 3200 Spare 1-2-400	42x67	
34	500	10	B	No SPARE	23x43	
35	1600	10	B	SPARE 2-400	32x88.10	
36	1600	10	B	SPARE 2-400	32x59	
37	4800	10	B	To increase to 6400 SPARE - 1-H	40x100	
38	3200	10	B	SPARE 2-400.	30x108	
39	1600	10	B	No SPARE	27x80	
40	9600	10	B	No SPARE	22x74	
40	9600	10	B	No SPARE	22x74	
41	500	10	F	No SPARE	26x40	
42	800	10	F	No SPARE	26x40	
43	500	10	F	No SPARE	26x40	

Estimate number

amount - 33'

75-47






60.

91-45.

80

69

v. Fort Central Station

N <sup>o</sup>	N <sup>o</sup> Lamps	C.P	Kind Bldg	REMARKS	Size of Building	PLAN of BUILDING
15						
75	3200	10	B	Spare	42' x 67'	
100	500	10	B	No increase	26' x 40'	
101	1000	10	B	No increase	31' x 45'	
102	1600	10	B	Spare	35' x 55' 6"	
104	3200	10	B	2 1/4' x 475'	42' x 64'	
105						

#### Canvass Books

Canvassing was the door-to-door, street-by-street survey of a municipality or neighborhood to determine the number of potential customers for a central station. This book probably dates from late 1882 or early 1883, when the Edison Electric Light Company directed canvassing operations through agents of the Edison Company for Isolated Lighting. The printed forms on its pages were designed to record data about each prospective customer, including the type of building, its use, the number of gas lamps in operation, the duration of their use, and miscellaneous information such as the presence of large trees that might interfere with electrical wires. Only the two pages of "General Instructions to Canvassers," which are glued to the inside front cover of the book, have been filmed. The remainder of the book was not used.

Related material can be found in the canvassing scrapbook of Alfred O. Tate (Miscellaneous Scrapbook Series). Three other books, dating from 1883-1884, contain the canvasses of Worchester, Massachusetts; Knoxville, Tennessee and probably New York City's second district. They have not been filmed.

# THE EDISON ELECTRIC LIGHT COMPANY,

65 Fifth Avenue, New York.

## GENERAL INSTRUCTIONS TO CANVASSERS.

1  
BLOCK NUMBER.

Upon new work, or where the dimensions of the district are not determined, and where the number of each block is not settled, it is better to distinguish the blocks by letters rather than figures.

2  
CANVASS  
RIGHT TO LEFT.

Go around each block towards your left hand (while facing the buildings), completing the block before crossing any street. Where any block front is cut by an alley or other passage-way, containing no buildings entirely detached from those fronting upon the street, merely write "cross (name) alley of (width) ft." If the alley contains separate buildings, canvass it as directed for streets.

3  
DESCRIPTION  
OF  
PREMISES.

Begin the first page with the number or letter of the block, followed by the name of the street, the side of the street (by compass), and the name of the cross street where you begin. Then, in the first division of the page, write the number of the building, the number of stories, and the number of the story or floor to which the opposite items refer, the material of the building by letters, as Marble (Marble), B. S. (Brown Stone), Bk. (Brick), W. (Wood), I. (Iron), etc., and the number of feet of frontage by tape, if convenient, or by careful pacing.

4  
NUMBERING  
OF  
FLOORS.

In regard to the number of stories or floors to a place of business, or to a public building, let that which is upon the level of the sidewalk or (if none is at that height) the floor next above the sidewalk, be the first floor, and the one next below the level of the sidewalk (even if only one step) be the basement. In dwelling houses the main entrance is on the first floor without regard to elevation.

5  
UPPER FLOORS.

Give the width of entrance to upper floors, and state whether included or not in the frontage of the building, as noted elsewhere; and the street number of the main floor of building under them, and also note whether each apartment is at the right or the left of the entrance to these floors, and whether it is front or rear; going

around each floor from right to left as in street work. This upper-floor examination should be done in its proper order, that is, if you arrive at its door-way before reaching the main business place upon the ground or first floor, let the upper part be canvassed before the latter.

Commence every block and every street at the top of a page, noting whether the building extends to the corner, or how many feet it lacks of reaching the corner; and upon completing the block state the same particulars of the last building.

Buildings are to be measured without any adjacent alley, unless such be covered by the building, when say "including alley of — feet."

Be particular about all alleys, lanes, or carriage-ways, and vacant lots as, Alley 3 ft. belongs to No—; Carriage way 8 ft. belongs to No—; Vacant 20 ft.; Vacant 24 ft. yard of No—; Covered alley 5 ft. measured with No—; Alley 9 ft. in common to interior of Block; Alley 12 ft. runs to, next street; Vacant 41 ft. burned down, etc., writing any of these items in Column No. 1, and giving to the description of each lot or other piece of land, a full division of the page.

Unoccupied houses are to be noted as empty, and lots with no buildings as vacant.

If permission can be obtained, ascertain the total number by actual count, and state under "Remarks" whether the number noted is by count or as given by the occupant.

The number of Gas Jets and lamps, in use between 5 and 6 P. M., summer or winter, or all day or all night, cannot generally be obtained by actual count; care must therefore be exercised to get from occupants a trustworthy estimate rather than a superficial statement.

6  
EVERY STREET  
OCCUPY A PAGE

7  
MEASUREMENT  
OF BUILDINGS.  
8  
VACANT LAND.

9  
TOTAL GAS JETS  
INSTALLED.

10  
NUMBER IN USE.

11  
CHURCHES,  
HOTELS, THEATRES,  
FACTORIES, ETC.

In Buildings of this character it is of the greatest importance to ascertain, in addition to the usual data, the number of hours during which the maximum number of lights is used, and the number of days in the year; also the time in which a lesser number (noting the number) is in use. HALLS and THEATRES, for example, are used to a great extent for rehearsals with a minimum number of lights, and factories, at certain seasons, or during the entire year, may be in operation during the night. Ascertain the number of holidays observed, and the class of buildings open or closed, as the case may be, upon such days, entering all the items in this paragraph in the column of "Remarks."

12  
IMPORTANCE  
LARGE BUILDINGS

The importance of obtaining a full canvass of LARGE BUILDINGS cannot be overestimated, and two hours spent in procuring complete information in a building containing one thousand lights is of more value than twice that time which may be consumed in taking the canvass of one hundred dwellings averaging ten lights each.

13  
ESTIMATES

If, for any building or occupant, a satisfactory canvass cannot be obtained after all rightful means, and due diligence for ascertaining the same have been employed, the canvasser upon this work having the most experience should enter the canvass for said building or occupant, to the best of his ability, in a different color from the rest of the canvass, and plainly note the same as "ESTIMATED."

14  
SIZE OF BURNERS

The size of Gas Burners is important, as they will vary generally in consumption from 3 to 8 cubic feet per hour. The maximum and minimum amount of gas bills, and the month should, if possible, be obtained.

15  
STEAM ENGINES,  
ETC.

Under the heading of Steam Engines, etc., let the power of the engine on the premises be noted, and when power is furnished from any other place, let it be noted as—*Ap.* Elevators and Hoists will be entered in the column as—*EL*—*H*, steam *EL*, etc.

16  
PAVEMENT,  
SOIL AND ROCK

Note in the column of "Remarks," also the kind of pavement of each sidewalk, and at the beginning of each block-front the kind in the carriage-way, marking the changes in the latter, if any occur; also the kind of soil, if visible, (or from enquiry), and whether rock appears at surface, or will probably be found in digging for laying conductors or setting poles.

17  
STREET  
OBSTRUCTIONS

Note upon each Block Front whether there are few, many, or no trees, also all Telegraph, Telephone, Electric Lights or other Poles; and, in general, whether erection of poles would be permitted by town officers.

Ascertain as soon as possible from the officers of the local Company, and report to the Engineering Department, the location, dimensions and price of the most eligible sites for proposed station, with full description of any buildings that may be upon them. SEE SPECIAL REPORT.

Make also special report of City, County and State rates of taxes; quality and cost of water, cost of coal and other fuel; wages of first and second-class engineers; cost of ordinary labor, and rates of Fire Insurance, etc.

Note each street lamp in the proper column, with its description; and in the same column, gas or other lights in the streets connected with buildings, giving full explanations and positions.

Confine Remarks strictly to their column, and let them be clear and definite, without useless words. Record only the facts as obtained in the canvass, without defiling the book with calculations or other figures.

When words or figures are to be repeated, enter them in full, and under no circumstances make use of symbols for this purpose.

Also note any other particulars of the district examined, so that nothing of importance escapes, and so that the compiler of the statistics from the canvassing books shall fully understand the returns, and shall be in no doubt as to what premises or parts of premises the collected items refer.

18  
CENTRAL STATION  
SPECIAL REPORT

19  
WATER, COAL, ETC.

20  
STREET LAMPS

21  
REMARKS

22  
AVOID SYMBOLS

23  
FINALLY

EDISON ELECTRIC LIGHT COMPANY,

CANVASS OF .....

VOL. ....

..... 188 .....

Comptroller



[illegible]

#### Record Book

This record book covers the period June 1883-April 1884. It was used by the Thomas A. Edison Construction Department to list towns canvassed for central stations and to record the percentage of central station contracts assigned to the Ansonia Brass & Copper Company. At the end of the book are 5 pages of sketches relating to dynamos and electric power distribution systems. The book contains 217 numbered pages. Only 18 pages have been used.

de  
676

Ausonia Bros. & Co.	1. 5.
Babcock & Wilcox	11
Canvases	21
Contracts	31
Canada Canvases	29

# Ansonia Brass & Copper Co.

1

1883

## Assignments

Oct 6	Fall River Mass	10%
Nov 13	Liffin Ohio	7 1/4%
Nov 13	Newburgh N.Y.	12 1/2%
Nov 15	Mt. Carmel Pa	12 1/2%
Nov 15	Hagleton Pa	12 1/2%
Nov 20	Pittsford Pa	12 1/2%
Dec 1	Middletown Ct	5%
" 1	Piqua O.	10%
Apr 22	" "	12 1/2%

N<sup>o</sup> 1 (500 Lbs)  
N<sup>o</sup> 2 (1000) Lbs

Ansonia Brass & Copper Co.  
Payments

Babcock & Wilcox

11

## Carroll

		Finished
Grand Knave Irish Broke	7/15	
<del>Wiles</del> <del>Wills</del>	<del>12/15</del>	<del>12/15</del>
Battle Creek	12/15	Abandoned
Appilanti	Coke	9/12
Melleborough	Anna Lyon	9/12
March Chunk	12/12	7/12
Bobville	4/12	12/13
Pottstown		
Lancaster	Lyon	
Lewisburgh		
Milton	12/15	
York		
Union City		
✓ Millersburg	Coke 12/15	Left Jan 19/83
Scranton		
Stuyvesant	done	
New Bedford	Coke	
Albany	Conna	
New Orleans	Alida Lye	4/12
Atlanta	La Wilbur	OK
Williamsport	Pa. Cooke	9/12
Mobile	Ala. Wilbur	✓ OK
✓ Danville	Va	OK
Galveston	Tex. Lye	OK
Dallas		OK
Sherman		OK
✓ Boston	done	
✓ Meriden	Conn	
✓ Middledale	Irish Cooke	12/15

Chamford, Ct  
 Telladachy, G. District  
 S. 7<sup>th</sup> St. do

Brumfield, G. H. Jr.  
 Chicago, Ill.

✓ Adm. Chabow, Chick. Cooke 12/15

✓ Burdette O. Lyon 12/1

✓ Adrian, Chick. Cooke 11/29

3/17/88 Hartford, Ky

" Lexington, Ky

" Newark, Conn

" South Chatham, Conn  
 Cedar Rapids, Iowa Cooke (Lung, 20/100)

Des Moines, Iowa

Chatham, Ky

✓ Farmington, Ky. Milner (Lung, 20/100)

Livingston, N. Y.

✓ Richmond, Va.

✓ Springfield, Mass. Cooke

Chicago, Ill.

✓ Westfield, Ill.

✓ Southampton, Ill.

✓ Newport, R. I. Cooke

✓ Providence, R. I. Baylis

✓ Ashland, Va.

✓ Sidney, O. Webster

✓ Troy, O. Webster

✓ Covington, Ky. Milner 3/10

# Connassess

✓ Cincinnati Block Chis (Jellies)  
~~Richmond~~ Maine - Crumshaw  
 Manchester N. H.  
 Dec 19/84 ~~Massachusetts~~ Cooke  
 Dec 19/84 Brooklyn, N. Y.  
 Oct 2/84 West Brunswick, N. J.  
 Fulton, N. Y.

(10/100)

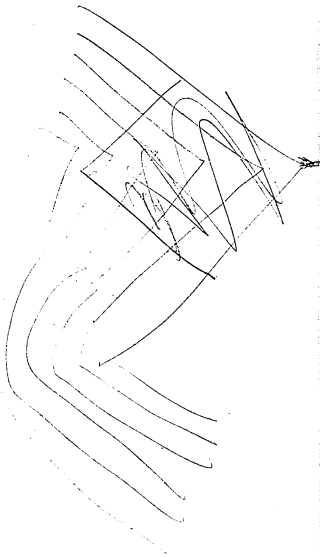
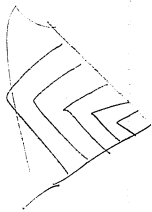


# Canadian Canvasses

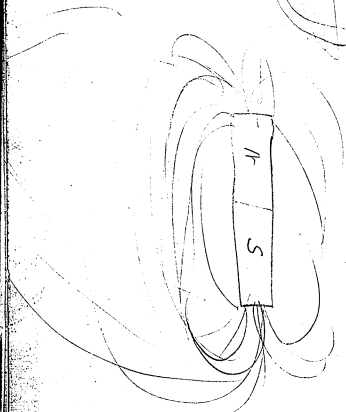
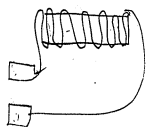
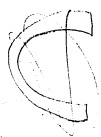
Feb 17/94 Sarnia Ont

*Payments due on Contracts*

31







Thomas A. Edison Construction Department Records [not filmed]

Mapping Department Books

This two-volume set, whose entries cover the period February 1883-April 1884, was apparently used by the mapping department of the Thomas A. Edison Construction Department. One volume contains an alphabetical listing by city of incoming maps prepared by the canvassers and forwarded to the Construction Department. The other volume records work done within the mapping department. The front cover of each book is labeled "Index Map Department." Each book contains 132 numbered pages. Only 33 pages in the first book and 32 pages in the second book have been used.

Gas Statistics Book

This book contains data about competing gas lighting companies. The information was gleaned from circulars sent in 1881 to Western Union telegraph stations across the United States. The statistics were used by the Edison companies to gauge the gas market competition. The entries appear in rough alphabetical order according to state and city. The book includes information about cities in most states from Alabama through New York inclusive. The front cover is labeled "Gas Statistics Book No. 1." The book contains 360 numbered pages.

Meter Book

This unused book was designed for the collection of data about the amount of electricity used by central station customers. It contains approximately 250 unnumbered pages.

Samuel Insull Pocket Notebook [PN-84-01-04]

This pocket notebook contains one dated entry for January 4, 1884. It consists of notes and calculations by Samuel Insull concerning various central station plants. Most of the notes are in shorthand.

Edison Electric Light Company of Europe, Ltd. Records

This scrapbook covers the period February-March 1884. It contains three documents: (1) a notice for a meeting of the stockholders of the Edison Electric Light Company of Europe, Ltd.; (2) a report, dated February 25, 1884, discussing proposals to merge the three French Edison companies: the Compagnie Continentale Edison, the Societe Electrique Edison; and the Societe Industrielle et Commerciale Edison; and (3) a report, dated August 15, 1884, discussing proposed changes to the 1883 contracts with the Deutsche Edison Gesellschaft, including the expansion of the company's business into Austria, Denmark, and Russia. The spine is labeled "European Co 1884 Edison Electric Lt. Co. of Europe." The volume contains 188 numbered pages and a table of contents.

Blank pages not filmed: 24-188.

## Contents.

S. B. E's memoranda on proposed International Co.  
(See Light Co. financial statement book, page 40).

S. B. E's statement as to claim against Cie. Continentale  
(See Light Co. financial statement book, page 74)

Call for special meeting of Stockholders March 7, 1884

Report to special meeting of Stockholders March 7, 1884

Page 2.

" 3



2.

OFFICE OF  
THE EDISON ELECTRIC LIGHT COMPANY  
OF EUROPE, LIMITED,  
65 FIFTH AVENUE

New York, February 25, 1884.

Sir:

A special meeting of the stockholders of this Company will be held at the office of the Company, No. 65 Fifth Avenue, New York City, on Friday, March 7th, 1884, at 12 o'clock noon, for the purpose of considering the present condition of the Company's affairs, and of taking action upon a proposition from Paris for merging the existing three French Companies into one Company.

THOMAS A. EDISON,  
President.

3

Report of the Board of Directors of the Edison Electric Light Company of Europe, Limited, to a special meeting of Stockholders, held March, 7th. 1884.

To the Stockholders of the Edison Electric Light Company of Europe, Limited:-

The following statement presents the condition of the Company's affairs; and the action already taken by the Directors upon the proposition from Paris for merging the three French companies into one Company.

The total cash receipts of the Company from its organization are as follows, viz.

Receipts prior to April 1881.....	\$ 34,820.00
Received from Paris in summer and fall of 1881 for Paris Exposition.....	30,000.00
Received from sale of Bonds from Nov. 1881 to November 1883.....	50,000.00
Received from Paris for Opera House plant.	1,600.00
Received for sale of underground mains..	418.52
	-----
	\$121,038.52

This money has been expended (1) on the expenses of the Paris Exhibition, including machinery, freights, and expenses of workmen, (2) patent fees, and (3) general cash expenses of the Company, including cablegrams and consul fees. The balance of cash now in the treasury is \$18.22. There are still some unpaid debts

for taxes, legal services, machinery, &c. amounting to about \$10,000.

No officer of the Company has ever received any salary whatever, nor has the Company ever paid any rent, or paid anything whatever for local expenses in this country, except one disbursement of \$400. for clerical assistance.

Regarding the proposition from Paris for merging the three French companies into one company, it will be necessary to call the attention of the stockholders to the history of our business in Europe, in order to intelligently present the present status.

In the summer of 1881, this Company made an exhibit at the Paris Electrical Exposition, pursuant to a contract made between this Company and Mr. Elie Leon of Paris, who furnished part of the money for the exhibit. The consideration given by us to Mr. Leon was the right to form an Edison Company for France. The outcome of our success at the Paris Exposition was the formation by Mr. Leon of a Paris syndicate which proposed to form three Companies in France to control the Edison light business for Europe. After considerable correspondence an agreement was arrived at, and the well known contract between the Paris Syndicate and this Company was executed, November 15th. 1881. Under this contract three Companies were formed in Paris, viz,

Cie. Continentale Edison, Capital.	1,000,000 francs.
Societe Electrique Edison, "	1,000,000 "
Societe Industrielle et Commerciale Edison, Capital.....	1,500,000 "

Total..... 3,500,000 francs.

Our Company was to receive, as consideration for the grant of its patent rights in Europe, founders shares, or parts of founder, in each of the above Companies, entitling us to certain percentages in the profits of the three Companies, after certain deductions. No Parts of Founder other than ours, in any of the Companies, were to be, and never have been, issued. Under this arrangement, we received the following Parts of Founder, viz:

(1) 8000 Parts of Founder of the Compagnie Continentale, entitling us to 80 per cent of the profits after certain deductions, mentioned below, the remaining 20 per cent of the profits going to the general stockholders.

(2) 3000 Parts of Founder of the Societe Industrielle, entitling us to 50 per cent of the profits, after certain deductions, mentioned below, the remaining 50 per cent of the profits going to the general stockholders.

(3) 3000 Parts of Founder of the Societe Electrique, entitling us to 60 per cent of the profits, after certain deductions, mentioned below, the remaining 40 per cent of the profits going to the general stockholders.

Our Company parted with certain portions of its Founders shares, giving them to the Paris syndicate and others as commissions. The commissions were as follows:

CIE CONTINENTALE:

To Messrs. Porges & Leon.....	800 parts of founder.
To special Commission.....	70 " " "

To Messrs. Puskas & Bailey....	356	parts of founder.
Balance.....	6,774	" " "
	8,000	" " "

SOCIETE INDUSTRIELLE:

Messrs. Porgas & Leon.....	750	parts of founder.
Messrs. Puskas & Bailey.....	112	" " "
Balance.....	2,138	" " "
	3,000	" " "

SOCIETE ELECTRIQUE:

Messrs. Porgas & Leon.....	500	parts of founder.
Messrs. Puskas & Bailey.....	125	" " "
Balance.....	2,375	" " "
	3,000	" " "

After surrendering portions of our parts of founder, as above, the balance remaining in our hands entitle us to the following share of the net profits, viz., 67  $\frac{74}{100}$  per cent in the net profits of the Cie. Continentale; 35  $\frac{8}{100}$  per cent in the profits of the Societe Industrielle; and 47  $\frac{1}{2}$  per cent in the profits of the Societe Electrique, or an average in all the three companies of 50  $\frac{1}{4}$  per cent.

The founders shares representing the above percentages are in the treasury of the company at New York, with the exception of 2000 parts of founder of the Cie. Continentale which were deposited with Messrs. Drexel, Morgan & Co., New York, March 3rd,

1884, in compliance with the arrangement made with the new syndicate in Paris, hereafter mentioned.

The certain deductions referred to above, taken out of the gross receipts of each of the three companies, severally, before any profits are to be divided between the general stockholders and the parts of founder, on the basis just stated, are as follows:

- (1) Payment of General Expenses.
- (2) One twentieth for legal reserve.
- (3) 6 per cent to stockholders.
- (4) Directors fees.
- (5) A percentage for redemption of capital.

The three companies have done a large business in Europe, but have thus far made no profits for division among the stockholders. The capital of the companies is now exhausted and additional money is needed in order to reap the benefit and profit resulting from the introduction of the light already made. This necessity for additional capital is admitted on all hands, and the present proposed plan of amalgamating the three companies, with increased capitalization, grows out of this need.

It is now proposed to merge the three Companies into one, the plan being to wind up the Societe Electrique and the Societe Industrielle, merging them in the Compagnie Continentale, and increasing its capital to 10,000,000. francs, - of which 3,500,000 francs in stock will be issued to the present general actual stockholders in the three existing companies in exchange, at par, for

their present stock. A new syndicate proposes to take the remainder of the stock, 4,300,000 francs, at par, certainly one half, and possibly the whole, to be paid in on signing the contracts. This money is to be used in part in installing a central station in Paris, costing, with real estate, about 5,250,000 francs.

It is proposed to call in all the existing Parts of Founder in all three Companies, being 1000 in all, as above, and to issue in exchange for them 1000 new ones in this large Company, entitling the holders to 40 per cent of the profits after deductions similar to those above named. No other founders shares will be issued. It is also proposed to pay in cash to these 1000 founders shares a royalty of 5 cents for every lamp used or employed by the Cie. Continentale (the new Company); These new parts of founder, 5000, are to be issued to our Company, but we are under obligation to transfer a certain portion of them, first, share for share to the other parties who now hold founders shares, as set forth above, and, second, to certain parties as compensation or commission for services rendered in bringing out the new company. This distribution is as follows: viz.

New Syndicate.....	2000	parts of founder.
Old Syndicate.....	1070	" " "
Puskas & Bailey.....	300	" " "
Special Commission..	70	" " "
	-----	
	4500	" " "
	-----	

There being 5000 parts of founder, 4500 parts will re-

main to this Company, after the above deduction, entitling this Company as holder of such 4500 parts, to 22 $\frac{1}{2}$  per cent of the net profits. In the proposed new company there is a provision for a lamp royalty, as just stated, of 25 centimes (5 cents) for every lamp used in Europe, including all renewals of the same, to be paid exclusively to the founders shares, as a part of the running expenses of the Compagnie Continentale. Our proportion of this lamp royalty, after the parts of founder are divided as above, will be 50 $\frac{1}{2}$  per cent.

It will be seen that our interest in the profits of the business, omitting for the present all reference to the lamp royalty, is reduced by this new arrangement. Whereas in the case of the three existing French companies we are entitled, after certain deductions mentioned above, on an average, to about one half the profits, in the case of this new company we are to receive less than one quarter of the profits. The question immediately arises, why are our profits to be thus lessened? The answer is that our representatives in Paris instruct us that it is impossible to procure abroad the additional capital imperatively required in the business unless we reduce our share of the profits. In other words, the money cannot be had on the old terms.

It should be noted, as a partial offset to this decrease in our share of the profits, that we have succeeded in securing a lamp royalty, which, being a fixed charge payable as part of the expenses of the business without reference to the fact whether there are profits or not, affords us a certain income, although for

the immediate present a small one. While the Directors deeply regret the necessity for this reduction in the existing terms, it has been impossible for them to secure better ones, and they have been obliged to accept this new division of profits as an imperative condition of securing additional capital.

There are certain other details touching this new organization which require especial mention. Our only knowledge about them is what we glean from the letters of Messrs. Bailey and Batchelor, but we believe that is correct. These details have all been carefully considered, and represent, as they now stand, the result of several months of discussion and correspondence between us and our friends at Paris. They are as follows; viz:

Our company is required to give up its right of vetoing contracts made by the French Company, and to give up also its right to veto any proposed consolidation or amalgamation with other companies. We are also required to consent to the use of any other than the Edison dynamos or lamp. The royalty, however, is to be paid to the parts of founder, whatever lamp may be used. In regard to the amalgamation with other companies, the new Continental Company will bind itself not to make any arrangement with another company which would diminish either the number or value of the 8000 parts of founder. We are to have 3 directors for 3 years in the proposed new company, also an active manager in our behalf, whose salary will be paid by the new Continental Company. There are some other modifications in the By-Laws of the new company but they relate principally to the number and value of shares

and other details not necessary now to be considered.

The conclusion reached touching this new company and our contract with it, the principal features of which are set forth in this report, has been arrived at only after protracted negotiation. Your Board was for several weeks in doubt whether it would not be for our interest to insist upon the existing three French companies being continued, and to refuse to consent to the amalgamation, especially on the terms demanded. It was only after your Board were convinced that additional money was imperatively required and could not be otherwise obtained, that they yielded. The time has arrived for a central station to be installed in Paris and a large amount of money was needed for the purpose. Money is also needed for manufacturing and other purposes. Our representatives found that the only practicable way in which this money could be had was to consolidate the three companies, and increase the capital stock. This of course necessitated the offering of inducements for the raising of the money, which inducement was finally settled upon as 2000 of the parts of founder in the proposed new company although it reduces our percentages in the profits, as above stated, to 22 1/2 per cent. However, Messrs. Batchelor and Bailey have satisfied us that it is the best that can be done.

Your Board having decided that it was for the interest of the stockholders to accept the proposition submitted from Paris for amalgamating the three companies, they endeavored to obtain sufficient time to submit in advance the project to the stockholders

ders for ratification... They felt that in such an important matter the stockholders themselves, assembled in general meeting, should take the responsibility. Every effort was accordingly used to induce our friends in Paris to grant us sufficient time, not to exceed even so short a delay as 12 days, to call a meeting of the stockholders. But owing to certain peculiar combinations touching our business in Paris, which your Board do not deem it expedient to set forth in detail at the present time, immediate decision was required from us. Your Directors accordingly, at a special meeting on the 31th. day of February 1881, instructed the President to cable to Messrs. Hatchelor and Bailey, authorizing them to sign an option to be given to the new syndicate to form the new Compagnie Continentale upon the terms above set forth. We have since received a cable from Paris stating that the option has been signed, and requesting us to deposit in escrow with Messrs. Drexel, Morgan & Co. 2000 parts of founder in the existing Compagnie Continentale. These are the parts of founder to be exchanged and given as commission, as set forth above, and pending the decision of the present syndicate in Paris, formed for the purpose of bringing out the new company, as to whether they will proceed in bringing the company out, these parts of founder are deposited in escrow. If before the expiration of the option, 60 days, they decide to bring the company out and guarantee the stock subscriptions and cash payments thereon, these parts of founder will be delivered over to the parties agreed upon, but if the company is not brought out and the cash subscriptions guaranteed, they will be returned

to our treasury.

The principal object of this meeting, called by your Directors, is to obtain the ratification by the stockholders of the action taken by your Board of Directors as expressed above.

There is another matter which your Board would mention in this report. It is that of the indebtedness of the Company upon its Debenture Bonds issued November 1st. 1881.

The Paris Exhibit of 1881 cost the Company a large sum of money only a portion of which was met by the advance made by Mr. Jeon. There were also other existing debts, amounting to about \$20,000 for patent solicitors fees, cash loans, &c. &c. It was therefore resolved by your Board to ask the stockholders to advance money to the Company in proportion to the stock held by them, taking at par debenture bonds at 3 years at 6 per cent for the amount advanced. Accordingly, a circular containing the foregoing proposition was sent to each stockholder September 8th. 1881. Only six replies were received. The total amount subscribed by these six stockholders was but a small fraction of the indebtedness, consequently these subscriptions were declined and that plan for raising money was abandoned.

Your Board then determined to call a special meeting of the stockholders to consider the question of creating a Debenture Bond indebtedness to raise money to discharge our indebtedness. Such meeting was held November 4th. 1881, a printed notice having been sent, October 20th. 1881, to each stockholder. The stockholders resolved that Debenture Bonds be issued not to exceed the amount of \$1,000,000 to run three years at 6 per cent interest, and

to be offered in such manner as the Directors might direct at not less than fifty cents on the dollar.

In accordance with the authority thus given by the stockholders, your Board passed a resolution, November 10th, 1884, authorizing bonds to be sold at fifty cents on the dollar or settlements to be made with the then existing creditors of the Company on the basis of paying them bonds at fifty cents in payment of their claims. Their being no market for the bonds, only a portion of the creditors accepted this offer, consequently it was necessary to sell bonds to outside parties. With some difficulty enough were placed to realize money to meet the then pressing demands against the company, and since then, from time to time, additional bonds have been sold, always at fifty cents on the dollar, to raise funds to meet interest and other small current demands. Latterly it has been very difficult to sell the bonds even at this low price, but customers have been procured, with considerable effort, so that the bonds have now all been issued, and the proceeds applied to indebtedness.

This bonded indebtedness, \$100,000, matures November 1st, 1884. The next semi-annual interest, \$3,000, is due May 1st, 1884. There are no funds now in hand to pay either the interest or the bonds. In the recent negotiations with the Paris syndicate touching the amalgamation of the three companies, your Board used every possible effort, even up to the point of nearly destroying the negotiations, to obtain a cash payment of 200,000 francs for our company. We failed to secure this. Some assurances have been given that the money will be advanced to us as

a loan, if the new company is brought out, provided a portion of our founders shares are deposited as security. Your Board is not without hope that money to pay the bonds, or to make new arrangements with the bond holders for an extension, can be procured in this way. But it is not clearly seen at present how money can be obtained to pay the semi-annual interest in May.

Your Board would like authority to pledge some of our founders shares, if necessary, to raise money to pay the May interest, and would also like to have the stockholders suggest a plan for meeting the question of settling the bonded debt at maturity next November.

8 16:  
The Edison Electric Light Company of Europe, Limited.

35 Fifth Avenue, New York, August 15th. 1894.

To the Directors of the Edison Electric Light Company  
of Europe, Limited:

This company is asked by Mr. Bailey to give its consent to certain proposed changes in the present contract with the German Co., and to certain modifications in the present arrangements with Messrs. Siemens & Halske, Berlin; and I beg to submit below a full statement of all the matters involved.

The German Edison Company now has by contract the right to exploit the Edison system in Germany, both by isolated plants and central stations. The Articles of Association of the German Co. (Article 33) allow that Co. to "erect branch-establishments and agencies of every description at home and abroad". Whether this means outside of Germany is not quite clear. The German Co. also possesses the right to manufacture all apparatus, including lamps. Messrs. Siemens & Halske also have the right to manufacture conjointly with the German Company on paying certain royalties to that Company. The Contracts, which were executed March 13th., 1883, give to the Compagnie Continentale Edison, of Paris, founders shares entitling it to 21 per cent of the net profits of the German Company after a six per cent dividend has been paid to the cash capital. They also provide for payment to the Cie Continentale of a royalty on each lamp used or sold in Germany equal to  $16\frac{2}{3}$  of the actual cost of the lamp to the German Company; also for the pay-

2

ment of royalties on the dynamos in each installation, at the rate of  $12\frac{1}{2}$  Marks (\$3.12) per horse power of the dynamos up to 50 horse power, and beyond that, 16 Marks (\$4) per horse power. The royalty on dynamos is not yearly and is to be paid once only. When the German Company was formed, it paid in cash to the Cie. Continentale, 350,000 Marks (\$97,500), and the Cie. Continentale is to forego the above royalties until they reach the said sum of 350,000 marks, an amortization of that advance cash payment thus taking place. The German Company now desire to add to their territory by taking also Russia, Austria and Denmark, and, while the change is being made in their contract, also to make some modifications in the terms of their original contract, March 13th., 1883.

The said proposed modifications are as follows:

1. The German Co. are now restricted to the Edison dynamo for incandescent lighting. They want the privilege of using any other type of dynamo they may choose.
2. The German Co. wish to be free to grant licenses to others to manufacture dynamos without the consent of the Cie. Continentale. Under the present contract such consent is imperative.
3. The German Co. wish to have the right to buy patents, the same to cost not more than \$5000 or \$7,500 a year. This is a new provision.
4. No royalty to be paid on dynamos by German Co.



They now pay the Cie. Continentale a royalty of \$3,12 (or \$4,00) per H. P., as explained above.

5. The lamp royalty to be raised from 18  $\frac{2}{3}$  of the cost of lamps to a fixed royalty of 40 centimes, and is to be paid for every lamp used or sold in Germany, Russia, Austria, or Denmark. So far as we can judge, the old royalty would be about six cents per lamp and would decrease as the cost of manufacture decreased, while the new royalty will be fixed and amount to 8 cents per lamp.

6. The German Co. would exploit the system in all four of the above Countries with its own capital and to establish agencies in each of those Countries.

7. The German Co. to give no license for manufacturing lamps, but must manufacture all lamps itself.

8. The German Co. to pay all present and future expenses of patents in all four of the above Countries.

The above Eight items constitute the modifications, so far as I can make them out, which the German Co. now asks to have made in the original contract of March 13, 1883.

It appears that in negotiating this new Contract, the Cie. Continentale have been endeavoring to obtain, in addition to the royalties &c. which they are already entitled to, a direct participation in the profits received by the German Co. from local companies formed by it in any of the above countries. Mr. Bailey writes us that the German Co. was, however, so decidedly opposed to this, that he (Mr. Bailey) was compelled to go to Berlin to talk over the matter in person. He writes us that the

above 8 specified points have been agreed to by the German Co. and the Board of Directors of the Cie. Continentale, but that no decision has been arrived at in regard to the said direct participation in profits. In a letter to us dated Berlin, July 15th., 1884, Mr. Bailey writes that he is convinced that it is out of the question to expect a direct participation in profits of local companies to be given to the Cie. Continentale, owing to the weak patent situation in the countries above named, also to the great competition in electric lighting, and to the fact that central station companies abroad are compelled to pay a tax to the municipal authorities of cities or towns where stations would be operated. Mr. Bailey encloses in his letter of July 15th., a copy of a long letter written by him to the Cie. Continentale Edison, Paris, recommending them to forego any direct participation in profits of local companies formed by the German Company, for the reasons above stated, also for the reason that great complications would ensue by insisting on the point.

Mess. Siemens & Halske being parties to the present contracts with the German Co., it will be necessary to obtain their consent to the above mentioned changes now proposed to be made touching the existing contract of March, 1883, as well as to any other modifications to such contract that may be proposed. This consent, however, they have refused to give. Mr. Bailey writes that he has discovered the reason of this refusal, which is that they have been antagonized by the German Company. It was contemplated by the original contract of March 1883, that they (Siemens & Halske) should manufacture most of the dynamos and lamps for the

German Company, and, it appears, they accordingly built a factory, they claim, for this purpose. But they now claim that the German Co. has used the prestige or influence of the combination with Siemens to obtain money from the public for its stock, and having obtained it, has given no orders to Siemens & Halske, thereby involving them in heavy losses on account of the factory, but has used its dynamos and material made by other manufacturers.

The German Co., Mr. Bailey writes us, has offered the following modifications in regard to Siemens & Halske, and in their interest, it being in Bailey's belief that by conceding the following points to Messrs. S. & H. they, in return, will consent to the eight changes named above. The following seven items cover the concessions proposed by Mr. Bailey in the interest of Siemens & Halske:

1. The German Co. to have liberty itself to make its own dynamos below 500 lamps capacity, but not to have them manufactured by any other manufacturer.

2. The German Co. to take back the right of exploiting arc lamps. This right was given them in Article 11 of the Agreement of March 13, 1883. The German Co. agreed not to exploit any other system of arc light than that of Siemens, or Edison, or a system technically in advance of both. S. & H. were to exploit all other lamps, and were given exclusive right for ships of the German navy.

3. Siemens (as well as the German Co.) to be relieved from the royalty on dynamos.

4. Siemens to continue to pay the royalty to the German Co. of 50 pfennige (about 10 cents) on lamps made by them. This is provided for in Article 6 of the above mentioned agreement, dated March 13, 1883.

5. The German Co. to be bound to purchase all central station dynamos from Siemens & Halske.

6. The German Co. to pay Siemens a royalty of 5 per cent on dynamos manufactured by itself.

7. The German Co. to admit Siemens & Halske to a participation in the Lamp Factory of from 25 to 33 per centum. Just what is meant by this, I am in doubt. It would appear, although I am not sure of it, that Siemens is to be allowed to be a partner in the Lamp Factory to this extent.

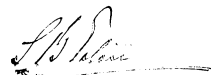
The above seven items, all of which I have stated as clearly as we can make out the meaning of what is intended from the correspondence, are still under discussion at Berlin and Paris. Our latest advices are that the discussion is still going on, the parties to the discussion being the German Co., Siemens & Halske, and the Cie Continentale. Mr. Bailey thinks that the discussion will result in having matters settled substantially on the basis outlined in this statement.

We are now asked by Mr. Bailey to approve all the matters now under discussion, a brief statement of which I have now made in this paper, and he desires us to cable him at once whether

we approve or not. To be more exact, it would appear that he wants to know, first, whether the first above named eight modifications in the existing contract of March 13th 1884, are satisfactory to this Company; and, second, whether, in order to secure the consent of Siemens & Halske to the aforesaid eight items, GE, the Edison Electric Light Co. of Europe, Limited, will give our permission to concede to Siemens & Halske the seven items last set forth above.

We are being continually called upon to make concessions, and are giving away first one thing and then another, so that in the end, judging from what has already occurred, it seems to me that we will have given away everything and will have little or nothing left. Has not the time come to hesitate before we make any further concessions? The status of our business in Europe cannot be much worse, and it may improve, consequently, it seems to me, we might take the risk of refusing to make further concessions so far as they involve a lessening of possible profits.

A meeting of the Directors of the Company to consider and take action on these questions will be held at the office of R. L. Cutting, Esq. No. 19 William Street, at one o'clock, Wednesday August 27th 1884. Mr. Batchelor will be invited to attend the meeting.



Second Vice President.

#### Edison Electric Light Company, Ltd. Records

These records cover the period 1881-1919 and include agreements, association papers, lists of stockholders, and other material relating to the Edison Electric Light Company, Ltd., the Swan Electric Light Company, Ltd., the Edison and Swan United Electric Light Company, Ltd., and their successor companies.

The documents are part of a collection of exhibits that were used as evidence in income tax litigation between Edison and the United States Internal Revenue Department in 1926-1929. The case arose from Edison's sale of his shares in the Edison Swan Electric Company, Ltd. The exhibits were contained in two binders, labeled "Edison-Swan Electric Light Co. Exhibit B" and "Edison-Swan Elec. Light Company Exhibit C." The material was disbound prior to microfilming.

EDISON - SWAN ELECTRIC LIGHT CO.

EXHIBIT - B

AGREEMENTS -  
ARTICLES OF ASSOCIATION  
MEMORANDUM OF ASSOCIATION  
of  
EDISON ELECTRIC LIGHT CO.

STAMPS

REGISTERED

Ex 2.16.1 B

New

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5/-

7 FEB 1881



AN AGREEMENT made the second day of February, 1881, BETWEEN JOSEPH WILSON SWAN, of Newcastle-upon-Tyne, Manufacturing Chemist, hereinafter called "the Vendor" of the one part, and ROBERT SPENCE WATSON, of the same place, Solicitor, on behalf of the hereinafter mentioned Intended Company (which ROBERT SPENCE WATSON is hereinafter called "the Promoter") of the other part.

WHEREAS the Vendor has obtained from Her Majesty Queen Victoria, Letters Patent for inventions in relation to lighting by electricity, and those Letters Patent are two in number, and are dated respectively, the second day of January, 1880, and the twentieth day of January, 1880, and he has applied for, and is about to obtain from Her Majesty, two additional Letters Patent for inventions of the like nature, and the Letters Patent so obtained, and about to be obtained, are hereinafter referred to as "the Home Patents."

AND WHEREAS the Vendor has also obtained, and may hereafter obtain, Letters Patent from the Governments of the Colonies and Dependencies of the United Kingdom, and from the Governments of Foreign Countries Letters Patent or Documents similar to Letters Patent in relation to his said invention, and the same Letters Patent and Documents already obtained and hereafter to be obtained, including all improvements and new inventions in relation to lighting by electricity are hereinafter referred to as "the Foreign Patents."

AND WHEREAS it has been agreed that a Company shall be formed for the purpose, among others, of purchasing from the Vendor the Home Patents.

NOW IT IS HEREBY AGREED as follows:-

1. The Promoter shall before the first day of May next, procure a Company with a capital of £100,000, divided into 10,000 shares of £10 each, to be incorporated under the Companies' Acts 1862 to 1880, by the name of "Swan's Electric Light Company, Limited," for the purpose, among others, of adopting and carrying this Agreement into effect.
2. The Memorandum and Articles of the Association of the Company, shall, before the registration thereof, be approved by the Company and by the Vendor.
3. The Vendor shall sell and the Company shall purchase the Home Patents, (the two not yet completed being completed at the expense of the Company), including extensions, and if any process used by the Vendor in the manufacture of the Lamps commonly known as Swan's Electric Lamps is not comprehended in any of the Home Patents, the same process is nevertheless to be included in the sale hereby agreed to be made to the Company, and such sale shall also include any Trade Mark which shall be obtained in reference to such Lamps.

4. The Vendor shall also sell, and the Company shall purchase, all his the Vendor's tenancy and interest in his manufactory, at Birkenhead, subject to the Company's paying all the expenses past and future, of the extensions now in progress.
5. The Vendor will also enter into a covenant with the Company to procure, at the expense of the Company, Letters Patent for any improvements, either by the Vendor alone, or by him in conjunction with any other person or persons, in the said inventions, or any of them, or for any new invention, either by him alone, or by him in conjunction with any other person or persons in anywise connected with or relating to the manufacture of Electric Lamps, or lighting by electricity, including any machinery or apparatus for such manufacture, or for producing, storing, distributing, or transmitting electricity, and will, at the like expense, assign the same Letters Patent to the Company, and such last mentioned Letters Patent shall be for the United Kingdom of Great Britain, Ireland, the Channel Islands, and the Isle of Man.
6. The Vendor will also enter into a covenant with the Company that, in case he, or his executors, or administrators, shall sell, or transfer, or license, the use of any of the foreign patents, he will require the Purchaser, Transferee, or Licensee, to engage that none of the Lamps or things manufactured, or made, wholly, or in part, according to such patent, shall be sent to the United Kingdom, and will, at the expense and risk of the Company, enforce, or endeavour to enforce, such engagements.
7. The Vendor will also enter into a covenant with the Company, that he will not, at any time hereafter, either solely or jointly, with, or as Manager or Agent, for any other Company, persons or person, directly or indirectly, carry on, or be engaged, or concerned, or interested in any business of the same or of a like nature to that carried on, from time to time, by the proposed Company, in any part of the United Kingdom, save so far as the Vendor shall, as a Member of the Company, be interested, or as an officer, agent, or servant of the Company, be employed in the business of the Company.
8. In consideration of the last five preceding clauses, the Company will pay to the Vendor, £25,000 in cash, by the following instalments, namely: £10,000 on the expiration of one calendar month, £5,000 on the expiration of twelve calendar months, £5,000 on the expiration of two years, £5,000 on the expiration of three years, £5,000 on the expiration of four years, and £5,000 on the expiration of five years from the incorporation of the Company; and if default shall be made in the payment of any instalment at the appointed time, the Company shall thenceforth pay to the Vendor, interest thereon, at the rate of 5 per centum per annum, until payment. Provided always that if before the whole of the said sum of £25,000 cash shall be paid, the Company shall be wound up, on the ground of non-success, so much of the said £25,000 as

shall not have become due and payable, shall not be paid, but shall be released.

9. As a further consideration for the 3rd, 4th, 5th, 6th, and 7th clauses, the Company shall, within one calendar month after its incorporation, allot to the Vendor, 2,500 £10 Shares in the Company, upon each of which the sum of £10 shall be credited as fully paid up. PROVIDED ALWAYS, that in the meantime, until the whole of the said capital of £100,000 shall be called up, the Vendor shall only be entitled to receive out of the profits of the Company, one-fourth of such part of the profits as shall be divided, and a sum equal to £5 per cent per annum on one-third of the uncalled up part, for the time being, of the same capital. AND the Company shall also enter into a covenant with the Vendor, that on every, or any, issue of new Shares which shall be made during his life, or within 21 years after his death, the Company, in respect of every or any increase in its Capital, will allot to him or his Executors, Administrators, or Assigns, Shares, equal to one-fourth of such issue, credited as fully paid up, but so that, in the meantime, until the whole amount payable on the other Shares issued, shall be called up, the Vendor, his Executors, Administrators, or Assigns, shall only be entitled to receive one-fourth of the divided profits of the Company, in respect of the whole issue. PROVIDED ALWAYS that this covenant shall not apply to any Shares issued, to purchase any Letters Patent, or to carry on any business, manufacture, or thing, not connected with the Vendor's Electric Lamps, or any improvements therein; and if any Shares issued shall be partly, for all or any of the purposes last aforesaid, and partly for purposes connected with the Vendor's Electric Lamps, or improvements therein, then a proportionate part only of the one-fourth shall be allotted to the Vendor, his Executors, Administrators, or Assigns. BUT this proviso is not to prejudice the right of the Vendor, his Executors, Administrators, or Assigns, to a pro rata allotment of Shares, as a member of members of the Company. PROVIDED ALWAYS that in case the Company shall be wound up whilst any sum shall remain uncalled up, either in respect of the original or any increased capital, the uncalled up sum shall only be required to be paid, if, or so far as necessary, for discharging the debts and liabilities of the Company, and not for the purpose of distribution, as between the members of the Company.
10. The Vendor will, for 7 years from the incorporation of the Company, if he shall so long live, retain in his own name, and in his own absolute ownership 1250 of the said 2500 Shares, and the Vendor will, for 14 years from the incorporation of the Company, hold as absolute owner, at least £5,000 of the paid up Capital of the Company.
11. The Vendor shall, subject to the Articles of Association, for 14 years from the incorporation of the Company, act as Managing Director of the technical department of the



business of the Company, provided he shall so long continue able to discharge the duties appertaining thereto, and such department shall be deemed to comprehend the manufacture of the lamps in its several branches; and whilst the Vendor shall act as such Managing Director, as aforesaid, he shall devote a sufficient part of his time and attention to the duties of the office, but shall not be required to give the whole of his time and attention thereto; and he shall be paid by the Company, as remuneration for his services as such Managing Director, the annual salary of £1,000, by equal quarterly portion, computed from the incorporation of the Company.

12. During a period of five years from the incorporation of the Company, if the Vendor so long lives, one of the other Directors of the Company shall always, or whenever the Vendor so requires, be a person who has been nominated by him.
13. The Company shall have the benefit of, and be subject to the obligations of the Agreement, dated the first day of February instant, between the Vendor and Henry Edmunds, the younger, and the Company shall also have the benefit of, and be subject to all now current contracts, orders, and liabilities of the Vendor, in relation to the supply or installation of lamps.
14. Upon payment of the first instalment of the said £25,000 cash, and upon the said 2,500 Shares being allotted to him, the Vendor will assign the Home Patents, and all other the premises hereby contracted to be sold to the Company. But the Company shall engage that until the other 5 instalments of the said £25,000 cash shall be paid, so much of the said capital of £100,000 as shall be equal in amount to the instalments or instalment, for the time being unpaid, shall remain uncalled up, and upon such payment of the said 1st instalment of the said £25,000 cash, and such allotment of the said 2,500 Shares, there shall also be executed and done, all such other deeds, acts, and things, as shall be necessary, or considered expedient for giving effect to this Agreement. PROVIDED ALWAYS that the Vendor shall not be required to enter into any covenant guaranteeing the validity of the Home Patents, not shall the Company require any evidence of such validity, or any evidence of the title of the Vendor to the said Manufactory, at Birkenhead.
15. All the costs and expenses of the preparation and execution of this Agreement, and attending the deeds, acts, and things mentioned or referred to in the last preceding clause, and of preparing and issuing the Prospectus, and of preparing the Memorandum and Articles of Association of the Company, and otherwise incidental to the incorporation of the Company, whether preliminary or not, shall be borne and paid by the Company.

16. Upon the adoption of this Agreement, by the Company, the promoter shall be discharged from all liability in respect thereof.
17. If the Company shall not be incorporated, and this Agreement adopted by them before the first day of May next, it shall be lawful for either of the parties hereto, by notice in writing to the other, to rescind the same, and in case this Agreement shall be so rescinded, neither of the said parties hereto shall have any claim against the other for compensation or expenses in relation hereto.
18. Any difference or question which may arise between the Vendor and the Promoter, or between the Vendor and the Company, as to the construction, effects, incidents, or consequences of these presents, or as to the assurances of the said premises or otherwise as to the mode of carrying out any of the clauses or purposes of these presents into effect, or as to the breach, or alleged breach, of any of the clauses herein contained, or as to any other matter or thing in any way relating to or arising out of these presents, shall as and when it arises, or as near thereto as circumstances will permit, be referred to an Arbitrator, to be mutually agreed upon, or failing such mutual agreement and appointment, to an Arbitrator, to be appointed by the Town Clerk, for the time being of the Borough of Newcastle-upon-Tyne, and the decision of the Arbitrator to be appointed in either of the ways aforesaid, shall be final and binding upon all parties; and the Arbitrator shall have power to award, by whom and how, and when, the costs of, and incident to, any such reference, are to be borne and paid; and this clause shall be deemed to be an Agreement to refer within the meaning of 11th Section of the "Common Law Procedure Act, 1854" but so that the time mentioned in the 15th Section for making his award, may be enlarged by the Arbitrator, and so that this Agreement, and any submission hereunder may be made a rule of any Division of Her Majesty's High Court of Justice.
19. AS WITNESS the hands of the parties, the day and year first hereinbefore written.
- Witness to the Signatures of -

JOSEPH WILSON SWAN, and

ROBERT SPENCE WATSON.

(Sgd) HILTON PHILIPSON.

14929 GNL 14422/1

Registered

1161

7 Feb 1881

THE COMPANIES ACTS, 1862 TO 1880.

COMPANY LIMITED BY SHARES.

MEMORANDUM OF ASSOCIATION  
of  
"SWAN'S ELECTRIC LIGHT COMPANY, LIMITED."  
=====

1. The name of the Company is "Swan's Electric Light Company, Limited."
2. The Registered Office of the Company will be situate in England.
3. The objects for which the Company is established, are:-
  - (a) To adopt and carry into effect, with or without modification, an Agreement, dated the second day of February 1881 and made between Joseph Wilson Swan, of the Borough and County of Newcastle-upon-Tyne, Manufacturing Chemist, of the one part, and Robert Spence Watson, for and on behalf of the said Company, of the other part, (a copy whereof is contained in the Schedule to the Articles of Association of the said Company), or otherwise to purchase and acquire, use, or sell, or otherwise, in any manner, deal with the letters patent for the United Kingdom, granted to the said Joseph Wilson Swan, for Improvements in Electric Lamps, and any other letters patent, which may hereafter be granted to him, in or for the United Kingdom.
  - (b) To acquire and use, or sell, or otherwise, in any manner, deal in any patents now granted, or hereafter to be granted to any person or persons whomsoever, for the use or application of electricity, magnetism, or other similar agencies, and to acquire and use, or sell, or otherwise, in any manner, deal with any process or processes, for the use or application of electricity, magnetism, or other similar agencies, in any manner whatsoever, and to acquire and use, or sell, or otherwise, in any manner, deal with any patents for improvements in, or additions to, such patents or processes respectively, and to acquire and use, or sell, or other-

wise, in any manner, deal with any other patents or processes in any manner relating to, or connected with, the machinery, plant, or apparatus, for the production, supply, or maintenance, of any electric or magnetic lights, or otherwise, whether the patents or processes mentioned in this clause, are, or may be, granted for, or protected in, the United Kingdom of Great Britain and Ireland, or elsewhere.

(c) To carry on the business of manufacturer of the plant, machinery, apparatus, fittings, and articles of every description whatsoever connected with the application of the said inventions patents, and processes, or any one or more of them, and of any part or parts thereof, and to purchase, sell, or let, or otherwise, in any manner, deal in such plant, machinery, apparatus, fittings, and articles, or any part or parts thereof.

(d) To carry on the business of lighting, with or by means of the said inventions, patents, and processes, or otherwise, and as part of such business, to enter into and carry into effect, contracts for lighting any place or thing whatsoever, and particularly, but without in any way restricting or limiting the foregoing general words, any district, town, city, village, street, square, road, house, shop, manufactory, bridge, mine, ship, carriage, building, establishment, room, or any part or parts thereof respectively, in any portion of the habitable globe.

(e) To sell, or purchase, or to grant or take licenses to use the said inventions, patents, and processes, or any of them, or any part or parts thereof, to or from any company or companies, partnership, person, or persons, in the United Kingdom of Great Britain and Ireland, or elsewhere, and that, subject to a royalty or royalties, or otherwise, in any manner whatsoever, and on any terms whatsoever, and to enter into any contract or agreement for the joint use thereof, by, or in connection with, any other Company, partnership, person, or persons, in any manner whatsoever, and on any terms whatsoever.

(f) To purchase, lease, or otherwise acquire for the use of the Company, and to occupy, or use, or to improve, manage, or develop, and to sell, lease, or otherwise dispose of or deal with any real or personal estate, either in the United Kingdom, or elsewhere, or any estate, right, or interest therein, and to erect, maintain, or reconstruct any buildings, plant, machinery, apparatus, and other things of any description, whatsoever, found necessary or convenient for the purposes of the Company, and to acquire, and use, and to sell, or grant licenses for the use of, any patents, patent rights, or processes, and any trade marks or trade inventions, or any interest therein respectively.

(g) To make and carry into effect arrangements for the union on interests, or for joint working, or for amalgamation, either in whole or part, with any other Company, Society, partnership, or person, carrying on business within the objects of this Company, and upon the terms either that ( so far as is consistent with this Memorandum) this Company, or the Company, Society, partnership, <sup>or</sup> person with which it shall make the arrangements, or some other Company, Society, partnership, or person, shall carry on the amalgamated business, and for all or any of the said purposes, if necessary, to establish any new Company, and to take shares in any such new or other Company, as partial or entire payment, or consideration, and to hold or sell such shares in any such new or other Company, or to distribute or allot them among the shareholders in this Company.

(h) To purchase, or acquire, and adopt, all, or any part of, the business, property, and liabilities of any Company, Society, partnership, or person formed for all or any purposes within the above objects, or with objects similar auxiliary or ancillary thereto, or in any way connected with the business which this Company is authorised to carry on, and to conduct, liquidate, and wind up its business and affairs.

(i) To sell, dispose of, or transfer, the business, property, and

undertaking of the Company, or any part thereof, in consideration of payment in cash, or in shares in another company, or in cash and shares.

(j) To borrow or raise money by the issue of, or upon, bonds, debentures, bills of exchange promissory notes or other obligations or securities of the Company, or by mortgage, or charge of all or any part of the property of the Company, or of its uncalled capital or without security, or in such other manner as the Company shall think fit, and with such powers of sale and rights of transfer, and upon such terms as to priority, or otherwise, as the Company shall think fit, and to make, accept, endorse, and execute promissory notes, bills of exchange, and other negotiable instruments of whatever kind or description.

(k) To invest the moneys of the Company not immediately required upon such securities, or in such manner, as may be, from time to time determined.

(l) To establish agencies, warehouses, and depots, for the purposes of the Company, in Great Britain and elsewhere, and to discontinue and regulate the same.

(m) To procure the Company to be constituted or incorporated as a Société Anonyme in any foreign country.

(n) To accept and take hold or sell shares or stock in any company, Society, or undertaking, the objects of which shall, either in whole or in part, be similar to those of this Company, or such as may be likely to promote or advance the interests of this Company, and to take in payment wholly or in part of the consideration of any contract, and to hold or sell the shares in any Company, Society, or undertaking, with which the Company shall enter into any contract.

(o) To obtain any Act of Parliament for the dissolution of the Company, and the incorporation of the members thereof as a Company, with objects similar in part, or altogether, to those of this Company, or for conferring any powers of this Company,

which may be deemed necessary or desirable for carrying out the objects of the Company, and to promote or oppose any bill in Parliament affecting the interests of the Company, and that either alone, or in conjunction with, any other Company or Companies, person or persons.

(p) To apply to Parliament, or to the Privy Council, or to any department thereof, or to any governments, municipal or other Corporations, or to any magistrates, or public authorities, or officers, or other persons or person, for, or to purchase, or otherwise acquire, and to work, use, and dispose of any powers, concessions, provisional orders, authorities, licenses, or privileges, which may be considered necessary or desirable for, or in relation to, the objects and business of the Company, and to make any arrangements, with any of the bodies or persons mentioned in this clause, with relation to any of the objects or business of the Company.

(q) To do all or any of the matters herein authorised, in any part of the world, and either alone or in partnership, or in conjunction with, or as factors or agents for any other Companies or individuals.

(r) To do all such other things as are incidental or conducive to the attainment of the above objects,

4. The liability of the Members is Limited.

5. The Capital of the Company is £100,000, divided into 10,000 shares of £10 each, with power to increase the same capital, or other the capital for the time being, and the shares of which any increased capital may, from time to time consist, may be divided into different classes, with such preference, guarantee, or privilege, as, between themselves, as shall be determined by the regulations of the Company subsisting from time to time.

We, the several persons whose names and addresses are subscribed, are desirous of being formed into a Company, in pursuance of this Memorandum of Association, and we respectively agree to take the number of Shares set opposite our respective names.

Names and Addresses and Descriptions of Subscribers.	Number of Shares taken by each Subscriber.
John Williamson, of Southgarth, Westoe, in the County of Durham. Chemical Manufacturer.	1.
Hilton Philipson, No. 6. Prior Terrace, Tynemouth. Northumberland. Colliery Owner.	1.
Alexander Shannon Stevenson, of No. 45 Front Street, Tynemouth. Northumberland. Chemical Manufacturer.	1.
James Craig, of No. 11 Prior's Terrace, Tynemouth, Northumberland. Merchant.	1.
James Hall, of No. 9 Prior Terrace, Tynemouth. Northumberland. Ship Owner.	1.
John Theodore Merz, of The Quarries, in the Borough and County of Newcastle-upon-Tyne, Chemical Manufacturer.	1.
Richard Sims Donkin, Camp Ville, North Shields, Northumberland. Shipowner,	1
John Cameron Swan, Dean Street, Newcastle-on-Tyne. Merchant.	1

Dated the 3rd day of February, 1881.

Witness to all the above Signatures,

Robert Spence Watson.

Solicitor. Newcastle-on-Tyne.



14929 C N L.14422/2

Registered

1162

7 Feb 1881

ARTICLES OF ASSOCIATION  
of  
SWAN'S ELECTRIC LIGHT COMPANY, LIMITED.  
=====

It is agreed as follows:-

1. The regulations contained in the Table marked "A", in the first Schedule to "The Companies' Act 1862," shall not apply to this Company.

INTERPRETATION.

2. In the construction of these Articles, the following words and expressions shall have the following meanings, unless such meanings be excluded by, or be inconsistent with, the subject or context, viz.:-

"The Statute" means and includes "The Companies' Act 1862," and every other Act now or hereafter to be in force, concerning Joint Stock Companies with limited liability, and which applies to the Company.

"The Company," means Swan's Electric Light Company, Limited.

"General Meeting" means a General Meeting of this Company.

"Month" means calendar month.

"Board" means the Board of directors.

"Special resolution" means a special resolution passed in accordance with section 51 of "The Companies' Act, 1862."

Words importing the singular number only, include the plural number.

Words importing the plural number only, include the singular number.

Words importing the masculine gender only include the feminine gender.

Words importing natural persons only, include corporate bodies mutatis mutandis.

BUSINESS.

3. The business of the company shall include the several



objects expressed in the Memorandum of Association, and all matters which, from time to time, shall appear to the Directors to be expedient for attaining those objects, and may be commenced as soon after the registration of the Company as the board in its discretion shall think fit, notwithstanding that the whole of the shares have not been subscribed for, allotted, or taken up.

#### SHARES.

4. 2,500 of the Shares of the Company shall be allotted as provided by the agreement with Joseph Wilson Swan, mentioned in the Memorandum of Association, and set forth in the Schedule hereto, and upon each of these Shares the full sum of £10 shall be considered to have been paid.

5. A written application for Shares in the Company, followed by an allotment, and by notice of such allotment given to or received by the applicant, shall be deemed to be an acceptance by the applicant of the Shares allotted, and shall authorise the Directors to place the applicant on the Register as a Member of the Company, subject to these Articles.

6. If two or more persons are registered as joint holders of any Share, any one of such persons may give effectual receipts for any dividend or other sum of money payable in respect of such Share.

7. Every Member shall give to the Secretary or have at the registered office of the Company, notice, in writing, of an address in the United Kingdom, and no Member who shall change his name or address, or, being a woman, shall marry, and no husband of any such last mentioned Member shall be entitled to receive any dividend or to vote until notice of the change of name or address or marriage be given to the secretary in order to permit of its being registered.

8. No person shall be recognised by the Company as having title to any fractional part of a Share, nor otherwise than as the sole holder, or, as a joint holder of the entirety of such Share, nor

shall the Company be bound by, or recognise any, equitable, contingent, future, or partial interest in any Share in the nature of a trust or otherwise.

9. Subject to the other provisions of these Articles, the Shares of the Company shall be under the control of the Directors, who may allot or otherwise dispose of the same to such persons, upon such terms, and at such times, as they may think fit, and for the benefit of the company.

10. The Directors shall have full power to allot fully or partially paid-up Shares as the consideration, or part of the consideration, for any purchase or transaction made or entered into by them, or as the remuneration for any services rendered in the promotion or formation of the Company, or in the carrying out of the objects of the Company, and the Directors may attach to any Shares so allotted under this clause such conditions as to the transfer of such Shares, or any portion of them, as they may deem fit.

11. Every allottee of paid-up or partially paid-up Shares shall be credited in the books of the Company with the amount agreed upon.

12. Every Member shall be entitled to a Certificate under the Common Seal of the Company, specifying the Share or Shares held by him. Each Certificate shall specify the amount paid up thereon at the time of issuing the same, and the Secretary shall, whenever required by a Member endorse on his Share Certificate the further amounts from time to time paid-up thereon; and the Certificate of any Share, which may be the subject of joint ownership, shall be delivered to the person first named on the register.

13. If such Certificate is worn out or lost, it may be renewed on payment of 10/-, or such other sum as the Directors may prescribe, but no person shall be entitled to a new Certificate in place of that alleged to have been lost or worn out without

furnishing to the Company such evidence of loss or wear, and such indemnity in respect of the issue of the new Certificate, and otherwise as the Directors shall reasonably require.

14. The Company shall have a first and permanent charge and lien upon all Shares, and on all dividends declared or payable in respect thereof, for all moneys due to, and liabilities subsisting with, the Company, from or on the part of the registered holder, or any of the registered holders thereof, either alone or jointly with any other person, including any call the resolution for which shall have been passed by the Directors, although the time appointed for its payment may not have arrived. But the registration of a Transfer of any Shares shall determine such lien.

#### CALLS ON SHARES.

15. The Directors may, from time to time, make such calls upon the Members in respect of all moneys unpaid on their Shares as they think fit: two months, at least, shall be the interval between successive calls, and fourteen days' notice, at least, of each call shall be given to each Shareholder; no call shall exceed £2 per share.

16. A call shall be deemed to have been made at the time when the resolution of the Directors authorising such call was passed.

17. If the call payable in respect of any Share is not paid before or on the day appointed for payment thereof, the holder, for the time being, of such Share, shall be personally liable to pay the same to the Company, together with interest for the same, at the rate of £10 per cent. per annum, from the time appointed for the payment thereof to the time of the actual payment.

18. On the trial of any action which may be brought by the Company to recover any debt due for any call, it shall be sufficient to prove that the name of the defendant is on the register of Members of the Company as a holder of the number of Shares in respect of which such debt accrued, and that notice

of such call was duly given to the defendant in pursuance of these Articles of Association, and that such call was not paid, and it shall not be necessary to prove the appointment of the Directors who made such call, nor that a quorum of Directors was present at the Board at which such call was made, nor that the meeting at which such call was made was duly convened or constituted, nor any other matter whatsoever, but the proof of the matters aforesaid shall be conclusive evidence of the debt.

19. The Directors may, if they think fit, receive from any Member willing to advance the same, all or any part of the moneys due upon the shares held by him, beyond the sum actually called for; and upon the moneys so paid in advance, or so much thereof as, from time to time, exceeds the amount of the calls then made upon the shares in respect of which such advance has been made, the Company may pay interest at such rate as the Member paying such sum in advance and the Directors agree upon; and this Article, if so agreed, shall apply to Shares allotted under the 10th Article.

20. The joint holders of Shares shall be severally, as well as jointly, liable to the payments of all calls in respect thereof.

#### TRANSFER AND TRANSMISSION OF SHARES.

21. The instrument of transfer of any Share in the Company shall be executed by the transferee as well as the transferor, and the transferor shall be deemed to remain a holder of such share until the name of the transferee is entered in the Register Book in respect thereof. Before any transfer shall be registered, intimation of the application to register shall be forwarded by post to the transferor and the transferee, and such transfer shall not be registered until two days after such intimation shall have been forwarded.

22. Shares in the Company shall be transferred in any form which the Directors may approve of, and, subject to the

regulations hereinafter contained, may be transferred to any person not being an infant, lunatic, or otherwise under any legal disability, but Shares may be transferred or held by a married woman for her separate use.

23. There shall be paid in respect of the registration of any transfer, or transmission of Shares, in the Company such sum, not exceeding 5s, as the Board shall, from time to time, prescribe, and, when the registration is effected, the instrument of transfer shall be kept by the Company.

24. The Directors may decline to register any transfer of Shares made by a Member who is indebted to the Company, or who may be solely or jointly liable to it for any call or interest thereon, or in respect of any bill, note, security, or advance, notwithstanding the same may not be then due, or in any case where the Directors shall consider the proposed transferee to be an irresponsible person, or that the transfer will not be conducive to the interests of the Company. Any Member whose transfer shall not be allowed by the Directors, may, if he shall think fit, appeal to a General Meeting, and the decision of such Meeting shall be final.

25. The transfer books shall be closed during the ten days immediately preceding, and the seven days immediately after, the Ordinary General Meeting in each year, and may also be closed at such other time or times as the Directors shall deem expedient, so that the same be not closed for any greater period in the whole than one month in each year.

26. The Executors or Administrators of a deceased Member shall be the only persons recognised by the Company as having any title to his Share.

27. Any person becoming entitled to a Share, in consequence of the death, bankruptcy, or insolvency of any Member, or in consequence of the marriage of any female Member, may be registered as a Member upon such evidence being produced as may, from time to

time, be required by the Directors.

28. Any person who has become entitled to a Share, in consequence of the death, bankruptcy, or insolvency of any Member, or in consequence of the marriage of any female Member, may, instead of being registered himself, elect to have some person, to be named by him registered as a transferee of such Share.

29. The person so becoming entitled shall testify such election by executing, to his nominee, an instrument of transfer of such Share.

30. Any instrument of transfer shall be presented to the company, accompanied with such evidence as the Directors may require to prove the title of the Transferor, and thereupon, and upon payment of the registration fee, the Company shall register the transferee as a Member. But this Article is without prejudice to Article 24.

#### SURRENDER OF SHARES.

31. The Directors may, by a resolution of at least three-fourths of their number, confirmed by a General Meeting of the Company, accept in the name and for the benefit of the Company a surrender of the Shares of any Member who may be desirous of retiring from the Company, all sums whatever, for the time being, payable in respect of such Shares having been previously paid by such Member, and such Shares shall be disposed of in such manner for the benefit of the company as the Directors shall think fit.

#### FORFEITURE OF SHARES.

32. If any Member or his executors or administrators fails to pay any call on the day appointed for payment thereof, the Directors may, at any time thereafter during such time as the call remains unpaid, serve a notice on him, his executor, or administrator, (or if none, by advertisement, twice in the Times, and twice in some newspaper, published daily, in Newcastle-upon-Tyne, and such notice shall be deemed sufficiently given if so advertised) requiring payment of such call, together with interest and any

expenses that may have accrued by reason of such non-payment.

33. The notice shall name a further day, on or before which such call, and all interest and expenses that have accrued by reason of such non-payment are to be made. It shall also name the place where payment is to be made (being either the registered office of the Company or some other place at which calls of the Company are usually made payable), and shall also state, that in the event of non-payment at or before the time, and at the place appointed, the Shares, in respect of which such call was made, will be liable to be forfeited.

34. If the requisitions of any such notice as aforesaid are not complied with, any Share, in respect of which such notice has been given, may, at any time thereafter, before payment of all calls, interest, and expenses, due in respect thereof, has been made, be forfeited by a resolution of the Directors to that effect.

35. The Directors may also, by resolution, forfeit any shares for the purpose of enforcing the charge or lien given by Article 14 for money other than calls due to the Company, but only after such notice, and subject to such conditions, *mutatis mutandis*, as are expressed in Articles 32, 33, and 34.

36. Any Share so forfeited shall be deemed to be the property of the Company, and may be disposed of in such manner as the Directors, for the benefit of the Company, may think fit.

37. In the meantime, and until any Share so forfeited shall be re-sold, re-allotted, or otherwise disposed of, as aforesaid, the forfeiture thereof may, at the discretion and by a resolution of the Directors be remitted, as a matter of grace and favour, and not of right, on payment of the call, interest, and expense (if any) owing thereon to the Company at the time of the forfeiture being declared, with interest on the whole at the rate of 10 per cent. per annum up to the time of the actual payment thereof, if the Directors shall think fit to receive the same, or on any other terms which the Directors may deem reasonable.



38. Any Member, whose shares have been forfeited, shall, notwithstanding, be liable to pay to the Company all calls, interest, and expenses, owing upon such Shares at the time of the forfeiture.

39. Neither the receipt by the Company of a portion of any moneys which shall, from time to time, be due from any Member of the Company, in respect of his Share, either by way of principal or interest or otherwise, nor any indulgence granted by the Company in respect of the payment of any such moneys, shall preclude the Directors from thereafter proceeding to forfeit such Share as herein provided.

40. The forfeiture of a Share shall involve the extinction of all interest in and also all claims and demands against the Company, in respect of the Share, and all other rights incident to the Share, except only such of those rights as are by these Articles expressly reserved.

41. A statutory declaration, in writing, that a call in respect of a Share was made, and notice thereof given, and that default in payment of the call was made, and that the forfeiture of the Share was made by a resolution of the Directors to that effect, shall be sufficient evidence of the facts therein stated as against all persons entitled to such Share, and such declaration, and the receipt of two of the Directors for the price of such Share shall constitute a good title to such Share; and a certificate of proprietorship shall be delivered to the purchaser, and thereupon he shall be deemed the holder of such Share, discharged from all calls due prior to such purchase, and he shall not be bound to see to the application of the purchase money, nor shall his title to such Share be affected by any irregularity in the proceedings in reference to such sale or forfeiture.

42. In case the whole or any part of the business or assets of the Company shall be sold, or in case the Company shall be amalgamated with any other Company, in accordance with the powers in

these presents, or in the Memorandum of Association contained, and the whole or any part of the consideration for such sale or amalgamation shall consist of Shares in any other Company, and any Member of this Company or other person shall neglect or refuse to comply with any regulations, which may be made affecting the Shares of the Company, for the purpose of carrying such sale or amalgamation into effect, it shall be lawful for the Directors to forfeit the Shares to which any person, who shall so neglect or refuse, shall be entitled; but in every case the Company shall pay the full market value of such Shares, at the time of the forfeiture thereof, such value, in case of difference, to be ascertained by arbitration, in manner hereinafter provided,

#### CONVERSION OF SHARES INTO STOCK.

43. The Directors may, with the sanction of the Company previously given at an Extraordinary General Meeting, convert any paid-up registered Shares into Stock, which shall possess the same right of voting and other rights, and be transferable in the same manner, as nearly as circumstances will admit, as Shares of the same amount.

#### INCREASE OR REDUCTION IN CAPITAL.

44. The Directors may, from time to time, with the sanction of a General Meeting, create any additional Capital, divided into Shares of such amount, as the General Meeting, sanctioning such creation, directs; or, if no direction is given, as the Directors shall determine.

45. All new Shares shall carry such rights and have such preference or priority (if any) as to dividend or otherwise, and shall be subject to such regulations, as the General Meeting sanctioning the creation of such new Shares, shall determine.

46. All Shares or Stock, issued under the last two preceding Articles, shall be offered to the Members in proportion to the existing Shares held by them, and such offer shall be made by

notice specifying the number of Shares or portions of Stock to which the Member is entitled, and limiting a time within which the offer, if not accepted, will be deemed to be declined; and after the expiration of such time, or on receipt of an intimation from the Member to whom such notice is given, that he declines to accept the Shares offered, the Board may dispose of the same, in such manner, as they think most beneficial to the Company; provided that, if owing to the inequality in the number of Shares to be issued, and the number of Shares held by Members willing to accept the same respectively, any difficulty shall arise in the apportionment of such Shares, or any of them, the same shall be determined and settled as the Board think fit.

47. In the 45th Article, any capital raised by the creation of new Shares shall be considered as part of the original capital, and shall be subject to the same provisions with reference to the payment of calls, and the forfeiture of Shares on non-payment of calls or otherwise, as if it had been part of the original capital.

48. The Capital of the Company may, from time to time, with the consent of the Members, expressed by special resolution, be reduced to such an extent, as may, by such resolution, be then determined. The Board may, on such resolution being passed, apply to the proper Court, and do all other necessary things expedient to obtain the confirmation thereof.

#### GENERAL MEETINGS.

49. The first General Meeting shall be held at such time, not being more than four months after the registration of the Company, and at such place, as the Directors may determine, and subsequent General Meetings shall be held at such time and place as may be prescribed by the Company in General Meeting; and, if no other time or place is prescribed, a General Meeting shall be held on such day in February, in every year, and at such place as may be determined by the Directors.

50. The above-mentioned General Meetings shall be called Ordinary Meetings; all other General Meetings shall be called Extraordinary.

51. The Directors may, whenever they think fit, and they shall, upon a requisition made, in writing, by not less than one-fifth in number of the Members of the Company, convene an Extraordinary Meeting.

52. Any requisition made by the Members shall express the object of the Meeting proposed to be called, and then shall be left at the registered office of the Company.

53. Upon the receipt of such requisition, the Directors shall, forthwith, proceed to convene an Extraordinary General Meeting. If they do not proceed to convene the same within twenty-one days from the date of the requisition, the Requisitionists, or any other Members amounting to the required number, may, themselves, convene an Extraordinary General Meeting, to be held at the office of the Company, or at some convenient place within five miles distant therefrom, but not elsewhere, at such time as having regard to the Company's regulations as to notice, the Requisitionists may, themselves, fix.

54. Seven days' notice, at the least, specifying the place, the day, and the hour of Meeting, and, in case of special business, the general nature of such business shall be given to the Members, in manner hereafter mentioned, or in such other manner, if any, as may be prescribed by the Company, in General Meeting, but the non-receipt of such notice by, or the accidental omission to give such notice to, any Member shall not invalidate the proceedings at any General Meeting.

55. Any Member entitled to vote may, on giving not less than four days' notice, submit any resolution to a Meeting beyond the matter contained in the notice of such meeting. Notice of such additional resolution shall be given by leaving a copy of the resolution at the registered office of the Company.

# PROCEEDINGS AT GENERAL MEETINGS.

56. Minutes shall be made in books provided for that purpose, of the proceedings of every Meeting, and every minute signed by any person purporting to be the Chairman of the Meeting to which it relates, or to be the Chairman of the Board, shall be sufficient evidence of the facts therein stated.

57. All business shall be deemed special that is transacted at an Extraordinary Meeting, and all that is transacted at an ordinary Meeting, with the exception of sanctioning a dividend, and the consideration of the accounts, balance sheets, and the Ordinary Report of the directors.

58. No business shall be transacted at any General Meeting, except the election of a Chairman and the declaration of a Dividend, unless a quorum of Members is present, personally or by proxy, at the time when the Meeting proceeds to business, and such quorum shall be ascertained as follows, - that is to say, if the persons who have taken shares in the Company, at the time of the Meeting, do not exceed ten in number, the quorum shall be three; if they exceed ten, there shall be added to the above quorum one for every twenty-five additional Members, with this limitation, that no quorum shall, in any case, exceed ten, and for this purpose joint owners of any share shall be together numbered as one Member only.

59. If within one hour from the time appointed for the Meeting, a quorum is not present, the Meeting if convened upon the requisition of Members, shall be dissolved; in any other case, it shall stand adjourned to the same day in the next week, at the same time and place, and if, at such adjourned Meeting, a quorum is not present, those Members present, personally, or by proxy, shall be a quorum, and may transact the business for which the Meeting was called.

60. The Chairman (if any) of the Board of Directors shall preside as Chairman at every General Meeting of the Company; but

if there is no such Chairman, or if at any Meeting he is not present within fifteen minutes after the time appointed for holding the Meeting, or should decline to take the Chair, then some one of the Directors present at the Meeting (if any) shall preside at such Meeting, and in case no Director shall be present, or be willing to take the Chair, then the Members present shall choose one of their number to be Chairman.

61. The Chairman may, with the consent of the Meeting, adjourn any Meeting from time to time, and from place to place; but no business shall be transacted at any adjourned Meeting other than the business left unfinished at the Meeting from which the adjournment took place.

62. No business shall be discussed or transacted at any General Meeting, except the election of a Chairman whilst the chair may be vacant.

63. At any General Meeting, unless a poll is demanded by at least five Members, a declaration by the Chairman that a resolution has been carried, and an entry to that effect in the book of the proceedings of the Company, shall be sufficient evidence of the fact, without proof of the number or proportion of the votes recorded in favour of, or against, such resolution.

64. If at any meeting, a poll is demanded by notice in writing, signed by five or more Members present at the meeting personally and entitled to vote, it shall be taken in such manner as the Chairman directs; and the result of such poll shall be deemed to be the resolution of the company in general Meeting. In the case of an equality of votes at any General Meeting, the Chairman shall be entitled to a second or casting vote. No poll shall be demanded on the election of a Chairman of a Meeting, or on any question of adjournment.

#### VOTES OF MEMBERS.

65. Every Member shall have one vote for every five shares held by him up to fifty, and he shall have an additional vote

for every fifty shares beyond the first fifty, but no Member shall have more than twenty votes.

66. If any Member is a lunatic or idiot, he may vote by his Committee, curator bonis, or other legal curator, such person having previously furnished to the Directors such evidence as they shall require of his title to represent such Member.

67. Except as provided in the preceding clause, no person other than a Member duly registered, and who shall have paid everything for the time being due from him and payable to the Company in respect of his share, shall be entitled to be present, personally, or by proxy, at any General Meeting of the Company.

68. If two or more persons are jointly entitled to a share or shares, the member whose name stands first in the register of Members, as one of the holders of such share or shares, and no other, shall be entitled to vote in respect of the same.

69. No Member shall be entitled to vote at any General Meeting unless all calls due from him have been paid; and no Member shall be entitled to vote in respect of any share that he has acquired by transfer, at any meeting held after the expiration of three months from the registration of the Company, unless he has been possessed of the share in respect of which he claims to vote, for at least three months previously to the time of holding the meeting at which he proposes to vote.

70. Votes may be given either personally or by proxy.

71. The instrument appointing a proxy shall be in writing, under the hand of the appointer, or if such appointer is a Corporation, under the Common Seal. No person shall be appointed a proxy who is not a Member of the Company.

72. The instrument appointing a proxy shall be deposited at the registered office of the Company, not less than twenty-four hours before the time for holding the meeting at which the person named in such instrument proposes to vote; but no instrument appointing a proxy shall be valid after the expiration of twelve months from the date of its execution, unless in the case of

the adjournment of any Meeting first held previously to that time.

73. Any instrument appointing a proxy shall be in the following form:-

SWAN'S ELECTRIC LIGHT COMPANY, LIMITED.

I, \_\_\_\_\_ of \_\_\_\_\_ being a  
Member of "Swan's Electric Light Company, Limited," and  
entitled to \_\_\_\_\_ vote or \_\_\_\_\_ votes, hereby appoint  
of \_\_\_\_\_ as my proxy to vote for me, and on  
my behalf, at the (Ordinary or Extraordinary as the case may be)  
General Meeting of the Company to be held on the \_\_\_\_\_ day of  
\_\_\_\_\_ and at any adjournment thereof.

Dated this \_\_\_\_\_ day of \_\_\_\_\_

No act or vote, done or given by a proxy shall be rendered  
invalid by the revocation of the appointment, by death or other-  
wise, until notice of such death or revocation shall have been  
given to the Directors.

74. No objection shall be made to the validity of any vote,  
except at the Meeting or poll at which such vote shall be  
tendered; and every vote whether given personally or by proxy,  
not disallowed at such meeting or poll, shall be deemed valid  
for all purposes of such Meeting or poll whatsoever.

75. The Chairman of any Meeting shall be the sole and absolute  
judge of the validity of every vote tendered at such Meeting or  
at the poll demanded at such Meeting, and may allow or disallow  
the votes tendered according as he shall be of opinion that  
the same are or are not valid.

DIRECTORS.

76. The number of Directors shall not exceed fifteen, or be  
fewer than five, and the first Directors shall be James Cochran  
Stevenson of South Shields in the County of Durham M.O.  
Hilton Philipson of Tynemouth in the County of Northumberland  
Coal Owner Alexander Shannon Stevenson of the same place



Chemical Manufacturer James Craig of the same place Merchant John Theodore Merz of the Borough and County of Newcastle-upon-Tyne Manufacturer Joseph William Swan of the same place Chemist and John Cameron Swan of the same place Merchant, and at any time before the Ordinary Meeting, in the year 1881, the Board may, from time to time, add to their number, by the appointment of duly qualified Members as Directors, so as the whole number of Directors shall never exceed fifteen, or be less than three.

77. The qualifications of a Director shall be the holding of Shares or Stock, in his own right, of the nominal value of £1,000 or upwards.

78. The office of any Director shall be vacated-

(a) If he hold any other office, or place of profit, under the Company, except that of Manager or Managing Director, or legal adviser of the Company.

(b) If he be declared lunatic, or become of unsound mind.

(c) If he become bankrupt, or suspend payment, or attempt to compound with his creditors.

(d) If he cease to hold the required number of Shares or Stock, to qualify him for the office.

(e) If he continuously absent himself from the Meetings of the Board, without leave from the Board, for a period of six months.

(f) If he resign his office.

(g) If he participates in the profits of any contract with, or work done for, the Company, except and subject as mentioned in the next two Articles.

Unless these disqualifying conditions, or any of them, shall be dispensed with in any special case by a resolution of the Members of the Company in General Meeting.

79. Notwithstanding the last preceding article, no Director shall vacate his office by reason of his being interested in any contract with, or any work done for, the Company, provided the next article be complied with.

80. If any Director be either directly or indirectly concerned or interested in any contract proposed to be made by, or on behalf of, the Company, whether for lands, materials, work to be done or for any purpose whatsoever, during the time he is a Director, he shall, on the subject of any such contract in which he may be so concerned or interested, be precluded from voting or otherwise acting as a Director. And if any contract or dealing shall be entered into, in which any Director shall be interested, then the terms of such contract or dealing shall be submitted to a Meeting of the Board, and no such contract shall have force until approved and confirmed by the majority of the votes of the Directors present at such Meeting.

81. The continuing Directors may act, notwithstanding any vacancy in their body.

#### POWERS OF DIRECTORS.

82. The Directors shall manage the business of the Company in such manner as, in their judgment and discretion, they may think most expedient; and may exercise for this purpose all such powers and do all such acts and things, as are not by the Statute, or these Articles directed or required to be exercised, or done by the company in General Meeting subject, nevertheless, to these Articles, and subject also to such valid regulations as may be, from time to time, prescribed by the Company in General Meeting; but no regulation made by the Company in General Meeting shall invalidate any prior act of the Board which would have been valid if the regulation had not been made.

83. Without prejudice to the generality of the Article hereinbefore contained, it shall be lawful for the Directors, from time to time, to do any of the matters and things following, that is to say:-

(a) To pay the preliminary expenses of, and incidental to, the formation of the Company.

(b) To adopt and carry into effect, with or without modification, the agreement with Jos. Wilson Swan mentioned in the Memorandum of Association.

(c) To exercise the powers given by "The Companies' Seal Act, 1864," which powers the Company is hereby expressly authorised to exercise.

(d) To appoint and remove Managing Directors, Secretaries, Engineers, Managers, Solicitors, Architects, Bankers, Agents and Officers and Servants of the Company, and to confer on them respectively such powers, not exceeding the powers of the Board of Directors, and to pay them such remuneration, and to take or require such security or indemnity as the Directors may think fit.

(e) To borrow in the name or otherwise on behalf of the Company such sums of money as they, from time to time, think expedient, either by way of mortgage of the whole or any part of the property of the Company, including its unpaid Capital, with or without power of sale, or by bonds or debentures, transferable, or otherwise, or in such manner as they may deem best, and any such sums may be borrowed from any of the Directors; and it is particularly declared that, any such mortgage may be to an incorporated or unincorporated Building Society, and, that, for the purposes of such a mortgage, any of the Directors, or any other persons or person appointed by the Board, may individually become members or a member of, and take shares in any such Society; and the Shares may, from time to time, be transferred to others of the Directors or other persons or person as the Board may, from time to time, think fit, and it is also particularly declared that any moneys borrowed may be secured by vesting all, or any of, the property of the Company, including its unpaid capital in Trustees, with such powers of sale, and other powers, as may be thought proper.

(f) In the ordinary course of business of and for the Company, to make, accept, draw, or endorse any promissory note, bill of exchange, banker's draft, bill of lading, or such other like

instrument on behalf of the Company, or to adopt or act in that behalf in the ordinary course of the business of the Company, or in pursuance of a resolution of the Board authorising the act in question.

(g) To refer to arbitration any matter in difference between the company and any person, whether a Member or not.

(h) To concur with any other company, or person, in carrying into effect any purpose or object of the Company.

(i) To purchase, or acquire, and adopt, the whole, or any part, of the business, property, and liabilities of any other such company, society, partnership, or person, as mentioned in paragraph (h) of clause 3 of the Memorandum of Association but subject to the approval of an Extraordinary Meeting of the Company.

(j) To enter into contracts and arrangements for the sale of the property and goodwill of the business of the Company to any other Company, or person, or for the amalgamation of the Company with any other Company, upon such terms as the Directors may deem fit, but subject to the approval of an Extraordinary Meeting of the Company.

(k) To determine on the device for the Seal of the Company, and cause the same to be executed, and to make regulations for the custody and uses of such seal.

(l) To institute, conduct, or compromise, terminate, and abandon any civil action, or other proceeding, relating to the property or affairs of the Company, and to compound for, or abandon any debt or debts due to the Company, and to give time to any debtor for the payment of his debt.

(m) To pay the consideration money for any real or personal property to be purchased by the Company or the Directors, or for any services rendered to the Company, either preliminary to the formation of the Company, or subsequent thereto, or for any services rendered, or to be rendered, by any Agent of the Company, wholly in money, or in Shares in the Company, fully paid-up or

otherwise, or partly in money, and partly in Shares, fully paid-up or otherwise, as may be agreed upon between the persons so to be paid and the Directors.

(n) To defer the payments of calls upon any Shares upon such terms as they may think advisable.

(o) To determine what buildings shall be erected, pulled down, rebuilt, or altered, and by whom and on what terms; also what contracts shall be entered into, and what works executed by the Company, and on what terms.

(p) To purchase, or acquire and work, any patent rights or licenses, and to apply for or obtain letters patent in the United Kingdom or elsewhere, and to sell or license the use thereof.

(q) To take any conveyance or lease in the name of Trustees for the Company, and to give the Trustees such indemnity as they and the Directors may, from time to time, agree upon.

(r) To sell and dispose of, in such manner as they shall think fit, or to let on lease or otherwise, any of the buildings, offices lands, property, and premises of the Company, when the same, in the opinion of the Board, shall be no longer required for the purposes of the Company, or may be disposed of to the advantage of the Company.

(s) To buy, or take on lease, any real or personal property that they may think requisite for the purposes of the Company, and again to sell the same.

(t) To invest any surplus capital of the Company in Government or real securities, or such other securities, or in such Shares as they may, with the sanction of the Company in General Meeting, select, but except under Article 31, they shall not employ any part of the funds of the Company in the purchase of its own Shares.

(u) To open agencies and branch establishments.

#### PROCEEDINGS OF DIRECTORS.

84. The Directors shall elect one of their number Chairman at

their first Meeting after every annual election of Directors, and whenever he shall be absent from a Meeting of the Directors, a Chairman for such Meeting shall be appointed by the Directors present.

85. The Directors may appoint and cancel the appointment of such committees of their number as they may think fit, and may regulate the duties and procedure thereof, and delegate any of their powers thereto, except the power of making calls.

86. All acts done by any Meeting of the Directors, or of a committee of Directors, or by any person acting as a Director, shall, notwithstanding it may be afterwards discovered that there was some defect in the appointment of any such Director, or persons acting as aforesaid, or that they, or any of them were, or was, disqualified, be as valid as if every such person had been duly appointed, and was qualified to be a Director.

87. The Ordinary Meetings of the Directors shall be held at the registered Office of the Company, but the Directors may, nevertheless, meet together, for the despatch of business, at such other places, and, in either case, at such times and make such regulations as they think proper, for the summoning and holding of their Meetings, and the transaction of business thereat; and they may, from time to time, determine the quorum necessary for the transaction of business.

88. Questions arising at any Meeting shall be decided by the majority of votes of the Directors present, every Director having one vote; and, in case of an equality of votes, the presiding Chairman shall have a second or casting vote.

89. The Directors shall cause minutes to be made, in books provided for the purpose, of the following matters, viz.:-

- (a) Of all appointments of Officers made by the Directors.
- (b) Of the names of the Directors present at every Meeting of the Board; and the Members of Committees, appointed by the Board, present at every Meeting of the Committee.

(c) Of the proceedings of all the Meetings of the Board, and of all Meetings of Committees.

90. The minutes of any proceedings of any meeting of the Board, or of any such Committee, if signed by the person purporting to be the Chairman of the Meeting, or of the next succeeding Meeting shall be sufficient evidence, without further proof, of the facts therein stated.

91. Every receipt for purchase, mortgage, or other moneys, signed by two of the Directors, and countersigned by the Secretary, shall be an effectual discharge for the moneys therein expressed to be received, and shall exonerate every corporate body, or other persons or person, paying the same, from seeing to the application thereof, or being answerable for the loss, mis-application, or non-application, thereof; and every deed and other document, to which the Seal of the Company shall be affixed, shall be binding on the Company, as regards the purchaser, lender of money, or other person dealing with the Company in relation to any of the matters comprised in the same deed or document, it being intended that no such purchaser or other person shall be concerned to inquire whether the Seal was properly affixed.

92. Every Director, Auditor, Secretary, and other Officer, his heirs, executors, administrators, and assigns, shall be indemnified by the Company for all losses and expenses incurred by them respectively, in or about the discharge of their respective duties, except such as happen from their own respective wilful acts or defaults; and, in particular, every Director and person incurring any liability under Paragraph 2 of Article 83, by becoming Member of any Building Society, shall also be indemnified by the Company, and the Company may secure any such indemnity as hereinbefore mentioned, by a mortgage or charge, of all or any part of the property of the Company, or of its unpaid Share capital, or otherwise.

93. The Directors shall be entitled to receive, and be paid

yearly, such sum as may be voted by the Shareholders in General Meeting, as and for remuneration for their services as Directors, and such sum shall be divided amongst the Directors for the time being, in such manner and proportions as they shall, from time to time, determine among themselves.

#### MANAGING DIRECTORS.

94. The said Joseph Wilson Swan shall be the first Managing Director of the technical department of the business of the Company.

95. In addition to the powers and duties of an Ordinary Director, every Managing Director or Manager of the Company shall have and exercise such powers and authorities, and shall perform such duties in respect of the business and affairs of the Company as may, from time to time be vested in or assigned to him by the Board, provided that such powers and authorities shall not exceed those of the Board itself.

96. A Managing Director shall not, while he continues to hold that office, be subject to retirement by rotation, and he shall not be taken into account in determining the rotation of retirement, but he shall be subject to the same provisions as to vacating office as the other Directors, and may be removed by special resolution; and, if he cease to hold the office of Director from any cause, he shall, ipso facto and immediately, cease to be a Managing Director, but these provisions shall not apply to the said Joseph Wilson Swan during the fourteen years named in the agreement with him, mentioned in the Memorandum of Association, during which period he shall not be at liberty to resign, but may be removed by special resolution.

97. The remuneration of the Manager of Managers or Managing Director or Managing Directors shall, from time to time, be fixed by the Company in General Meeting, and may be by way of salary, or commission, or participation in the profits, or by any or all of these modes. But the said Joseph Wilson Swan shall receive



as Managing Director, the sum fixed by the First Agreement with leave scheduled hereto.

#### ROTATION OF DIRECTORS.

98. The said Joseph Wilson Swan shall continue a Director for fourteen years after the incorporation of the Company, unless removed by special resolution, and the said John Cameron Swan who has been nominated by him, shall continue a Director for five years from such incorporation, but if under Article 78 the said John Cameron Swan or any successor of his shall, during the said five years, vacate his office or die, the said Joseph Wilson Swan shall, if he think fit, supply the vacancy. Whilst the said Joseph Wilson Swan shall continue a Director under this Article, he shall not, and whilst the said John Cameron Swan and his successors shall, under this Article, continue a Director, he shall not be taken into account in determining the rotation of Directors. At the first Ordinary Meeting after the registration of the Company, the whole of the Directors shall retire from office, and at the first Ordinary Meeting in every subsequent year, one-third of the Directors for the time being, or if their number is not a multiple of three, then the number nearest to one-third, shall retire from office.

99. The one-third, or other nearest number, to retire during the first and second years ensuing to the first Ordinary Meeting of the Company shall, unless the Directors agree among themselves be determined by lot amongst themselves. In every subsequent year, the one-third, or other nearest number who have been longest in office, shall retire; and in case more than the number to retire shall have been in office for the same period, the Directors to retire shall be determined by lot amongst themselves.

100. A retiring Director shall be re-eligible.

101. The Company, at the General Meeting at which any Directors retire in manner aforesaid, shall fill up the vacated offices by electing a like number of persons.

102. If, at any Meeting at which an election of Directors ought to take place, the places of the vacating Directors are not filled up, the Meeting shall stand adjourned till the same day in the next week, at the same time and place; and if at such adjourned Meeting the places of the vacating Directors are not filled up, the vacating Directors, or such of them as have not had their places filled up, shall continue in office until the Ordinary Meeting in the next year, and so on, from time to time, until their places are filled up.

103. The Company, may, from time to time, in General Meeting, increase or reduce the number of Directors, and may also determine in what rotation such increased or reduced number is to go out of office.

104. Any casual vacancy occurring in the Board of Directors may be filled up by the Directors; but any person so chosen shall retain his office so long only as the vacating Director would have retained the same, if no vacancy had occurred.

105. The Company may, by a special resolution, remove any Director before the expiration of his period of office, and may, by an ordinary resolution, appoint another person in his stead. The person so appointed shall hold office during such time only as the Director in whose place he is appointed would have held the same, if he had not been removed.

#### DIVIDENDS.

106. The Directors may, with the sanction of the Company, in General Meeting (whenever in their opinion, the net profits will admit of it) declare a dividend to be paid to the Members, and may also, (whenever in their opinion, the net profits of the Company will admit of it), make and declare an interim dividend of such amount, and payable at such time, as they shall determine, but so that in declaring any dividend, they have regard to any preference dividends which may be payable on any preference Shares or shares created or raised under any special arrangement

as to dividend.

107. Except where otherwise provided, the dividends declared shall be payable on all shares (not being preference shares or shares created or raised under any special arrangement as to dividend) in proportion to the amount of capital for the time being paid up in respect of such shares.

108. No dividend shall be payable except out of the profits arising from the business of the Company.

109. The Directors may, before recommending any dividend, set aside out of the profits of the Company, such sum as they think proper, as a reserve fund, to meet contingencies, or for equalising dividends, or for enlarging, improving, renewing, repairing, or maintaining the works connected with the business of the Company or any part thereof, or to cover loss in wear or tear or other depreciation, or diminution in value of any property, which shall belong to, or from time to time, be acquired by the Company, and the Directors may invest the sum so set apart as a reserve fund, upon such securities as they may select, and may, from time to time, alter and vary such investments, Provided always that if and whenever the Directors consider that the amount of the reserve fund is unnecessarily large, they may, with the consent of a General Meeting, distribute such portion thereof, as they, with the like consent, may think unnecessary to retain among the holders of ordinary shares, as a bonus, such distribution being in proportion to the amount of capital for the time being paid up in respect of such shares.

110. The Directors may deduct from the dividends payable to any Member all such sums of money as may be due from him to the Company, on account of calls or otherwise.

111. Notice of any dividend that may have been declared shall be given to each Member, in manner hereinafter mentioned; and all dividends unclaimed for three years, after having been declared, may be forfeited, by the Directors, for the benefit of

the Company.

112. No dividend shall bear interest as against the Company.

#### ACCOUNTS.

113. The Directors shall cause true accounts to be kept--

- Of the stock-in-trade of the Company,
- Of the sums of money received and expended by the Company,
- and the matter in respect of which such receipt and expenditure takes place, and
- Of the credits and liabilities of the Company.

114. The books of accounts shall be kept at the registered office of the Company, (and subject to any reasonable restrictions as to the time and manner of inspecting the same that may be imposed by the Company in General Meeting, to three other clear days' previous notice to the Secretary,) shall be open to the inspection of the Members, during the hours of business.

115. Once at the least, in every year, the Directors shall lay before the Company, in General Meeting, a statement of the income and expenditure for the past year, made up to a date not more than three months before such Meeting.

116. The statement so made shall show, arranged under the most convenient heads, the amount of gross income, distinguishing the several sources from which it has been derived, and the amount of gross expenditure, distinguishing the expense of the establishment, salaries, and other like matters. Every item of expenditure, fairly chargeable against the years' income, shall be brought into account, so that a just balance of profit and loss may be laid before the Meeting; and in cases where any item of expenditure which may, in fairness, be distributed over several years, has been incurred in any one year, the whole amount of such item shall be stated, with the addition of the reasons why only a portion of such expenditure is charged against the income of the year.

117. A balance sheet shall be made out, in every year, and laid

before the Company, in General Meeting, and such balance sheet shall contain a summary of the property and liabilities of the Company, arranged under the heads appearing in the form annexed to Table A of the Act of 1862, or as near thereto as circumstances admit; and shall be accompanied by a Report of the Directors as to the state and condition of the Company, and as to any dividend they may be prepared to recommend.

118. A copy of such balance sheet shall be open to the inspection of the Members, at the registered office of the Company, for three days previously to the Annual Meeting.

#### AUDIT.

119. Once, at least, in six months, the accounts of the Company shall be examined, and the correctness of the balance sheet ascertained by one or more Auditor or Auditors.

120. The first Auditors shall be appointed by the Directors, subsequent Auditors shall be appointed by the Company, in General Meeting.

121. If one Auditor only is appointed, all the provisions herein contained, relating to Auditors, shall apply to him.

122. The Auditors may be Members of the Company, but no person is eligible as an Auditor who is interested, otherwise than as a Member, in any transaction of the Company, and no Director, or other officer of the Company, is eligible during his continuance in office.

123. The election of Auditors shall be made by the Company, at their Ordinary Meeting in each year.

124. The remuneration of the first Auditors shall be fixed by the Directors; that of subsequent Auditors shall be fixed by the Company in General Meeting.

125. Any Auditor shall be re-eligible on his quitting office.

126. If any casual vacancy occur in the office of an Auditor appointed by the Company, the Directors shall forthwith call an Extraordinary General Meeting for the purpose of supplying the

same.

127. If no election of Auditors is made in manner aforesaid, the Board of Trade may, on the application of not less than five Members of the Company, appoint an Auditor for the current year, and fix the remuneration to be paid to him by the Company for his services.

128. Every Auditor shall be supplied with a copy of the balance sheet, or proposed balance sheet, and it shall be his duty to examine the same with the accounts and vouchers relating thereto.

129. Every Auditor shall have a list delivered to him of all books kept by the Company, and shall, at all reasonable times, have access to the books and accounts of the Company. He may, at the expense of the Company, employ Accountants or other persons to assist him in investigating such accounts; and he may, in relation to such accounts, examine the Directors or any other officer of the Company.

130. The Auditors shall make a report to the Members upon the balance sheet and accounts, and in every such report shall state whether, in their opinion, the balance sheet is a full and fair balance sheet, containing the particulars required by these regulations, and properly drawn up, so as to exhibit a true and correct view of the state of the Company's affairs; and, in case they have called for explanations or information from the Directors, whether such explanations or information have been given by the Directors, and whether they have been satisfactory; and such report shall be read, together with the report of the Directors, at the Ordinary Meeting.

#### NOTICES.

131. Notices or other documents requiring to be served upon any Member, may be served, either personally, or by sending the same through the post in a pre-paid letter, addressed to such Member at his registered place of abode in the United Kingdom;

and no person who has not a registered place of abode in the United Kingdom shall be entitled to any notice, but such Member shall be treated and dealt with as having had notice, or as having agreed to dispense with notice, anything herein contained to the contrary notwithstanding.

132. All notices directed to be given to the Members shall, with respect to any Share to which persons are jointly entitled, be given to whichever of such persons is named first in the register of Members, and notice so given shall be sufficient notice to all the holders of such shares, and to all future holders of such Shares, or persons claiming under them.

133. Any notice, or other document, if served by post, shall be deemed to have been served at the time when the letter containing the same would be delivered in the ordinary course of the post, and, in proving such service, it shall be sufficient to prove that the letter containing the same was properly addressed, and put into the post office.

134. Every person who, by operation of law, transfer, or other means shall become entitled to any Share, shall be bound by any and every notice and other document, which, previous to his name and address being entered on the register in respect of such Share, shall have been given to, or left at, or sent to the address of the person, in whose name the Share shall have been previously registered, or would have been given, had such Member had a registered place of abode in the United Kingdom.

#### ARBITRATION.

135. If any difference, the manner of deciding which is not herein before prescribed, or which is directed to be settled by arbitration without further directions, arise between the Company and any Member, Trustee, representative, or other person, or bodies of persons to whom the regulations of these presents apply, such difference shall be referred to an Arbitrator, to be mutually agreed upon and appointed, or failing such mutual agree-

ment and appointment to an Arbitrator, to be appointed by the Town Clerk for the time being of the Borough of Newcastle-upon-Tyne, and the decision of the Arbitrator appointed in either of the ways aforesaid, shall be final and binding upon all parties, and the Arbitrator shall have power to award by whom, and how, and when the costs of, and incident to, any such reference are to be borne and paid, and this clause shall be deemed to be an agreement to refer within the meaning of the 11th section of the "Common Law Procedure Act, 1854," but so that the time mentioned in the 15th section for making his award may be enlarged by the Arbitrator, and so that this Agreement, and every submission hereunder, may be made a rule of any Division of Her Majesty's High Court of Justice.

We, the several persons whose names and addresses are subscribed, are desirous of being formed into a Company, in pursuance of this Memorandum of Association, and we respectively agree to take the number of Shares set opposite our respective names.

Names and Addresses and Descriptions of Subscribers.	Number of Shares taken by each Subscriber.
John Williamson, of Southgarth, westoe, in the County of Durham.. Chemical Manufacturer.	1.
Hilton Philipson, No. 6 Prior Terrace, Tynemouth. Northumberland. Colliery Owner.	1.
Alexander Shannon Stevenson, of 45 Front Street, Tynemouth, Northumberland. Chemical Manufacturer.	1.
James Craig, No. 11 Prior's Terrace, Tynemouth, Northumberland. Merchant.	1.
James Hall, No 9 Prior Terrace, Tynemouth. Northumberland. Ship Owner.	1.
John Theodore Merz, of The Quarries, in the Borough and County of Newcastle-on-Tyne. Chemical Manufacturer.	1.
Richard Sims Donkin, Camp Ville, North Shields. Northumberland. Shipowner.	1.



John Cameron Swan,  
1 Dean Street,  
Newcastle-on-Tyne. Merchant.

1.

Dated the 3rd day of February, 1881.

Witness to all of the above Signatures,

Robert Spence. Watson,

Solicitor..Newcastle-on-Tyne.

And I the said Robert Spence Watson hereby certify that the several alterations and additions respectively made in the 75th and 98th Clauses of the above Articles of Association, to which I have affixed my initials, were so respectively made with the consent and approbation of all the parties who have subscribed their names to the said Articles.

Robert Spence Watson.

## THE SCHEDULE.

referred to in the

## MEMORANDUM AND ARTICLES OF ASSOCIATION.

=====

AN AGREEMENT made the second day of February, 1881, BETWEEN JOSEPH WILSON SWAN, of Newcastle-upon-Tyne, Manufacturing Chemist, hereinafter called "the Vendor" of the one part, and ROBERT SPENCE WATSON, of the same place, Solicitor, on behalf of the hereinafter mentioned intended Company (which ROBERT SPENCE WATSON is hereinafter called "the Promoter") of the other part.

WHEREAS the Vendor has obtained from Her Majesty Queen Victoria, Letters Patent for inventions in relation to lighting by electricity, and those Letters Patent are two in number, and are dated respectively, the second day of January, 1880, and the twentieth day of January, 1880, and he has applied for, and is about to obtain from Her Majesty, two additional Letters Patent for inventions of the like nature, and the Letters Patent so obtained, and about to be obtained, are hereinafter referred to as "the Home Patents."

AND WHEREAS the Vendor has also obtained, and may hereafter obtain, Letters Patent from the Governments of the Colonies and Dependencies of the United Kingdom, and from the Governments of Foreign Countries Letters Patent or Documents similar to Letters Patent in relation to his said invention, and the same Letters Patent and Documents already obtained and hereafter to be obtained including all improvements and new inventions in relation to lighting by electricity are hereinafter referred to as "the Foreign Patents."

AND WHEREAS it has been agreed that a Company shall be formed for the purpose, among others, of purchasing from the Vendor the Home Patents.

NOW IT IS HEREBY AGREED as follows :-

1. The Promoter shall before the first day of May next, procure a

Company with a Capital of £100,000, divided into 10,000 Shares of £10 each, to be incorporated under the Companies' Acts, 1862 to 1880, by the name of "Swan's Electric Light Company, Limited," for the purpose, among others, of adopting and carrying this Agreement into effect.

2. The Memorandum and Articles of the Association of the Company shall, before the registration thereof, be approved by the Company and by the Vendor.

3. The Vendor shall sell and the Company shall purchase the Home Patents, (the two not yet completed being completed at the expense of the Company,) including extensions, and if any process used by the Vendor in the manufacture of the Lamps commonly known as Swan's Electric Lamps is not comprehended in any of the Home Patents, the same process is nevertheless to be included in the sale hereby agreed to be made to the Company, and such sale shall also include any Trade Mark which shall be obtained in reference to such Lamps.

4. The Vendor shall also sell, and the Company shall purchase, all his the Vendor's tenancy and interest in his manufactory, at Birkenhead, subject to the Company's paying all the expenses past and future, of the extensions now in progress.

5. The Vendor will also enter into a covenant with the Company to procure, at the expense of the Company, Letters Patent for any improvements, either by the Vendor alone, or by him in conjunction with any other person or persons, in the said inventions, or any of them, or for any new invention, either by him alone, or by him in conjunction with any other person or persons in anywise connected with or relating to the manufacture of Electric Lamps, or lighting by electricity, including any machinery or apparatus for such manufacture, or for producing, storing, distributing, or transmitting electricity, and will, at the like expense, assign the same Letters Patent to the Company, and such last mentioned

Letters Patent shall be for the United Kingdom of Great Britain, Ireland, the Channel Islands, and the Isle of Man.

6. The Vendor will also enter into a covenant with the Company that, in case he, or his executors, or administrators, shall sell, or transfer, or license, the use of any of the Foreign Patents, he will require the Purchaser, Transferee, or Licensee, to engage that none of the Lamps or things manufactured, or made, wholly, or in part, according to such patent, shall be sent to the United Kingdom, and will, at the expense and risk of the Company, enforce, or endeavour to enforce, such engagements.

7. The Vendor will also enter into a covenant with the Company, that he will not, at any time hereafter, either solely or jointly, with, or as Manager or Agent, for any other company, person or persons, directly or indirectly, carry on, or be engaged, or concerned or interested in any business of the same or of a like nature to that carried on, from time to time, by the proposed Company, in any part of the United Kingdom, save so far as the Vendor shall as a Member of the Company, be interested, or as an officer, agent, or servant of the Company, be employed in the business of the Company.

8. In consideration of the last five preceding clauses, the Company will pay to the Vendor, £25,000 in cash, by the following instalments, namely: £10,000 on the expiration of one calendar month, £3,000 on the expiration of twelve calendar months, £3,000 on the expiration of two years, £3,000 on the expiration of three years, £3,000 on the expiration of four years, and £3,000 on the expiration of five years from the incorporation of the Company; and if default shall be made in the payment of any instalment at the appointed time, the Company shall thenceforth pay to the Vendor, interest thereon, at the rate of £5 per centum per annum, until payment. Provided always that if before the whole of the said sum of £25,000 cash shall be paid, the Company shall be wound up, on the ground of non-success, so much of the said

£25,000 as shall not have become due and payable, shall not be paid, but shall be released.

9. As a further consideration for the 3rd, 4th, 5th, 6th, and 7th clauses, the Company shall, within one calendar month after its incorporation, allot to the Vendor, 2,500 £10 Shares in the Company, upon each of which the sum of £10 shall be credited as fully paid up. PROVIDED ALWAYS, that in the meantime, until the whole of the said capital of £100,000 shall be called up, the Vendor shall only be entitled to receive out of the profits of the Company, one-fourth of such part of the profits as shall be divided, and a sum equal to £5 per cent. per annum on one-third of the uncalled up part, for the time being, of the same capital. AND the Company shall also enter into a covenant with the Vendor, that on every, or any, issue of new Shares which shall be made during his life, or within 21 years after his death, the Company, in respect of every or any increase in its Capital, will allot to him or his Executors, Administrators, or Assigns, Shares, equal to one-fourth of such issue, credited as fully paid-up, but so that, in the meantime, until the whole amount payable on the other Shares issued, shall be called up, the Vendor, his Executors, Administrators, or Assigns, shall only be entitled to receive one-fourth of the divided profits of the Company, in respect of the whole issue. PROVIDED ALWAYS that this covenant shall not apply to any Shares issued, to purchase any Letters Patent, or to carry on any business, manufacture, or thing, not connected with the Vendor's Electric Lamps, or any improvements therein; and if any Shares issued shall be partly, for all or any of the purposes last aforesaid, and partly for purposes connected with the Vendor's Electric Lamps, or improvements therein, then a proportionate part only of the one-fourth shall be allotted to the Vendor, his Executors, Administrators, or Assigns. BUT this proviso is not to prejudice the right of the Vendor, his Executors, Administrators, or Assigns, to a pro rata allotment of Shares, as a member

or members of the Company. PROVIDED ALWAYS that in case the Company shall be wound up whilst any sum shall remain uncalled up, either in respect of the original or any increased capital, the uncalled up sum shall only be required to be paid, if, so far as necessary, for discharging the debts and liabilities of the Company, and not for the purpose of distribution, as between members of the Company.

10. The Vendor will, for 7 years from the incorporation of the Company, if he shall so long live, retain in his own name, and in his own absolute ownership, 1250 of the said 2500 Shares, and the Vendor will, for 14 years from the incorporation of the Company, hold as absolute owner, at least £5,000 of the paid up capital of the Company.

11. The Vendor shall, subject to the Articles of Association, for 14 years from the incorporation of the Company, act as Managing Director of the technical department of the business of the Company, provided he shall so long continue able to discharge the duties appertaining thereto, and such department shall be deemed to comprehend the manufacture of the Lamps in its several branches; and whilst the Vendor shall act as such Managing Director, as aforesaid, he shall devote a sufficient part of his time and attention to the duties of the office, but shall not be required to give the whole of his time and attention thereto; and he shall be paid by the Company, as remuneration for his services as such Managing Director, the annual salary of £1,000, by equal quarterly portions, computed from the incorporation of the Company.

12. During a period of five years from the incorporation of the Company, if the Vendor so long lives, one of the other Directors of the Company shall always, or whenever the Vendor so requires, be a person who has been nominated by him.

13. The Company shall have the benefit of, and be subject to the obligations of the Agreement, dated the first day of February

instant, between the Vendor and Henry Edmunds, the younger; and the Company shall also have the benefit of, and be subject to all now current contracts, orders, and liabilities of the Vendor, in relation to the supply or installation of Lamps.

14. Upon payment of the first instalment of the said £25,000 cash, and upon the said 25,000 Shares, being allotted to him, the Vendor will assign the Home Patents, and all other the premises hereby contracted to be sold to the Company. But the Company shall engage that until the other five instalments of the said £25,000 cash shall be paid, so much of the said capital of £100,000 as shall be equal in amount to the instalments or instalment, for the time being unpaid, shall remain uncalled up, and upon such payment of the said 1st instalment of the said £25,000 cash, and such allotment of the said 2,500 Shares, there shall also be executed and done, all such other deeds, acts, and things, as shall be necessary, or considered expedient for giving effect to this Agreement. PROVIDED ALWAYS that the Vendor shall not be required to enter into any covenant guaranteeing the validity of the Home Patents, nor shall the Company require any evidence of such validity, or any evidence of the title of the Vendor to the said Manufactory, at Birkenhead.

15. All the costs and expenses of the preparation and execution of this Agreement, and attending the deeds, acts, and things mentioned or referred to in the last preceding clause, and of preparing and issuing the Prospectus, and of preparing the Memorandum and Articles of Association of the Company, and otherwise incidental to the incorporation of the Company, whether preliminary or not, shall be borne and paid by the Company.

16. Upon the adoption of this Agreement, by the Company, the promoter shall be discharged from all liability in respect thereof.

17. If the Company shall not be incorporated, and this Agreement adopted by them before the first day of May next, it shall be

lawful for either of the parties hereto, by notice in writing to the other, to rescind the same, and in case this Agreement shall be so rescinded, neither of the said parties hereto shall have any claim against the other for compensation or expenses in relation thereto.

18. Any difference or question which may arise between the Vendor and the Promoter, or between the Vendor and the Company, as to the construction, effects, incidents, or consequences of these presents, or as to the assurances of the said premises or otherwise as to the mode of carrying out any of the clauses or purposes of these presents into effect, or as to the breach, or alleged breach, of any of the clauses herein contained, or as to any other matter or thing in anyway relating to or arising out of these presents, shall as and when it arises, or as near thereto as circumstances will permit, be referred to an Arbitrator, to be mutually agreed upon and appointed, or failing such mutual agreement and appointment, to an Arbitrator, to be appointed by the Town Clerk, for the time being of the Borough of Newcastle-upon-Tyne, and the decision of the Arbitrator to be appointed in either of the ways aforesaid, shall be final and binding upon all parties; and the Arbitrator shall have power to award, by whom and how, and when, the costs of, and incident to, any such reference, are to be borne and paid; and this Clause shall be deemed to be an Agreement to refer within the meaning of 11th Section of the "Common Law Procedure Act, 1854," but so that the time mentioned in the 15th Section for making his award, may be enlarged by the Arbitrator, and so that this Agreement, and any submission hereunder may be made a rule of any Division of Her Majesty's High Court of Justice.



19. AS WITNESS the hands of the parties, the day and year first  
hereinbefore written.

Witness to the Signatures of-

JOSEPH WILSON SWAN, and

ROBERT SPENCE WATSON.

(Signed) Joseph Wilson Swan.

Robt. Spence Watson.

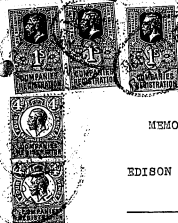
(Signed) Hilton Philipson.

15 MAR 1882

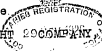
STAMPS

230 230 210

10/-



MEMORANDUM OF ASSOCIATION  
of the  
EDISON ELECTRIC LIGHT COMPANY  
LIMITED.



Mch. 15, 1882

1. The name of the Company is "The Edison Electric Light Company Limited".
11. The Registered Office of the Company will be situated in England.
111. The objects for which the Company is established are:-
  1. To adopt and carry into effect an Agreement, dated the 18th day of February 1882, and made between THOMAS ALVA EDISON of the first part; DREXEL MORGAN & COMPANY of the second part; EGISTO PAOLO FABBRI and GROSVENOR PORTER LOWREY of the third part; and the Right Hon. EDWARD PLEYDELL BOUVIER and others, whose names are thereto attached, of the fourth part (a copy of which is set out in the Schedule to the Articles of Association registered herewith), for the acquisition by the company of the several patents therein specified, being the whole of the patents taken out for the United Kingdom by the said Thomas Alva Edison or on his behalf in relation to the application of electricity or magnetism, as a lighting, heating and motive agent, subject to any modifications in the said Agreement, which may be agreed upon between the Company and the said Thomas Alva Edison and the said Drexel Morgan & Company.
  2. To acquire any additional letters patent, rights, or monopoly relating to the inventions mentioned in the said Agreement, or any inventions of a like character, or any interest therein upon any terms, and to take and work any license or licenses in connection with any such invention.
  3. To do all such things (including applications for disclaimer) as may be deemed expedient for using and otherwise obtaining the full benefit of the patents and inventions for the time being belonging to the Company, or in which it is interested, with full power to grant licenses for the use thereof, and to manufacture, sell, and let apparatus for the application of the said inventions.

4. To acquire the goodwill of, or any interest in, any trade or business, similar or analogous to any trade or business which the Company is authorised to carry on.

5. To acquire and work all necessary machinery, materials, and things, and to acquire by lease, purchase, or otherwise, any land or buildings, or to erect any buildings for any of the purposes of the Company.

6. To sell, improve, develop, manage, work, maintain, let, mortgage, or otherwise deal with, and dispose of, all or any part of the business and property of the Company, in such manner, on such terms, and for such purposes as the company may think proper.

7. To obtain and pay out of Capital the expenses of obtaining any Act of Parliament or any Provisional Order of the Board of Trade, for enabling the Company to carry all or any of its objects into effect.

8. To unite, co-operate, or amalgamate with any company hereafter to be established for, or already engaged in, objects similar or analogous to those of the Company, and to acquire, for the benefit of the Company, and in the name of the Company, or otherwise, all or any of the Shares, or Stock, or any other interest in any such Company, and to promote the formation of any such Company.

9. To do all such other things as are incidental or conducive to the attainment of the above objects.

IV. The liability of the Members is limited.

V. The Capital of the Company is £1,000,000, divided into 50,000 A Shares of £10 each, and 50,000 B Shares of £10 each, with power to increase the Capital, so that the same be divided into an equal amount of A Shares and B Shares but not otherwise.

WE, the several persons whose names and addresses are subscribed, are desirous of being formed into a company, in pursuance of this Memorandum of Association, and we respectively agree to take the number of ~~A~~ Shares in the capital of the Company set opposite our respective names.

Names, Addresses and Descriptions of Subscribers.	Number of "A" Shares taken by each Subscriber.
Edward Pleydell Bouverie 44 Wilton Crescent, Westminster W.C.	(500) five hundred
John Lubbock High Elm, Down, Kent, M.P.	(500) five hundred
William Gair Ratham 2 Fenchurch Corner Merchant	(500) Five hundred
Howard Gilliat 4 Crosby Square E.C. Merchant	(500) Five hundred
Wm. Fowler 38 Grosvenor Square, London. M.P.	(500) Five hundred
Frederick Joseph Bramwell F.R.S. Engineer. 37 Great George St., S.W.	(500) Five hundred
Edwd. Hibberd Johnson 57 Holborn Viaduct Electrical Engineer	(500) Five hundred 5000

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Dated the 15th day of March 1882

Witness to the above Signatures

Richard L. Harrison, Solicitor  
Clerk to Messrs. Waterhouse & Winterbotham  
1 New Court, Lincoln's Inn, W.C.  
Solsrs.

REGISTERED  
3805  
15 MAR 1882

Companies  
Registration  
Stamp 5/-

Stamp  
10/-

ARTICLES OF ASSOCIATION

OF THE  
EDISON ELECTRIC LIGHT COMPANY, LIMITED.

PRELIMINARY.

1. The regulations of Table A in the first schedule to the Companies' Act, 1882, shall not apply to this Company, except so far as the same are repeated or contained in these Articles.

2. The Company may from time to time exercise any powers which by the Companies' Acts, 1882 to 1880, a Company limited Shares may exercise if authorised by its Articles of Association, including therein the power to reduce its Capital whether paid up or uncalled, and either by cancellation of unallotted Shares or otherwise, and the power to divide its Capital or any part thereof into Shares of smaller, or to consolidate the same into Shares of larger amount than that fixed by the Memorandum of Association.

#### CAPITAL.

3. The registered holders of Shares in the Company for the time being whatever the number issued, shall be and continue associated, and the business of the Company may be at once commenced and the regulations for the management of the Company shall be in force.

4. The Shares shall, so far as consistent with the Agreement referred to in the Memorandum of Association (a copy of which is contained in the Schedule hereto), be allotted by and at the discretion of the Directors, and the A Shares shall have such preferential rights over the B Shares as are specified in the said agreement.

5. The Company may from time to time by an extraordinary Resolution increase its Capital beyond the amount mentioned in the Memorandum of Association by the creation of new A and B Shares as provided by the said Agreement, and such new A and B Shares, unless it be otherwise determined by such resolution, shall be offered in the first instance to the A Shareholders on the register in proportion to their respective holdings, and such new B Shares shall be allotted as provided by the said Agreement, but save as aforesaid all new Capital shall be allotted to such persons, and in such manner, and subject to such conditions as to Calls or otherwise, as the Board shall deem fit.

6. If several persons are registered as joint holders of any Share, any one of such persons may give effectual receipts for any Dividend, Bonus, or return of Capital payable in respect of such Share.

7. Every member shall be entitled to a Certificate or Certificates under the Common seal of the Company, specifying the Share or Shares held by him, and the amount paid up, or deemed to be paid up thereon, and if any such Certificate be worn out, defaced, destroyed, or lost, it may be renewed on payment of five shillings, or such less sum as the Directors may prescribe.

8. The Company shall not be bound by or recognise, even though having notice thereof, any other right in respect of a Share than an absolute right thereto in the registered holder thereof for the time being, and such right in case of transmission hereinafter mentioned.

#### TRANSFER AND TRANSMISSION OF SHARES.

9. The instrument of transfer of any Share in the Company shall be under seal and in such form as the Board may approve, and be executed both by the transferor and transferee, and the transferor shall be deemed to remain the holder of such Share until the name of the transferee is entered in the register book in respect thereof.

10. The Directors may in their absolute discretion, and without assigning any reason, decline to register any transfer of Shares not fully paid up made by a Member to any person not approved by them.

11. Every Deed of transfer must be left at the Office of the Company to be registered, accompanied by the Certificate of the Share to be transferred, and such other evidence as the Directors may reasonably require to prove the title of the transferor, or his right to transfer the Shares, and with the payment of such fee as the Directors shall from time to time determine, and thereupon the Directors, subject to the power vested in them by Article 10, shall register the transferee as a Shareholder, and shall retain the deed of Transfer.

12. The transfer books may be closed during the fourteen days immediately preceding every Ordinary general Meeting.

13. The executors or administrators of a deceased Member shall be the only persons recognised by the Company as having any title to his Shares, except in the case of Shares held on joint account, in which case the survivors only shall be recognised by the Company as the persons entitled to such Shares.

14. Any person becoming entitled to registered Shares, in consequence of the death or bankruptcy of any Member, or in consequence of the marriage of any female Member, or in any other way than by transfer, may upon such evidence sustaining the character in respect of which he proposed to act under this clause, as may from time to time be required by the Directors, or on his title being produced, either be registered himself as a Member in respect of such Shares, or subject to the regulations as to transfer herein contained, may transfer the same to any other person.

# CALLS ON SHARES.

15. The Directors may from time to time make such Calls upon the Members in respect of all moneys unpaid on their Shares as they may think fit, provided that one month's notice at least be given of each Call.

16. Each Member shall be liable to pay the amount of every Call so made on him to the person and at the time and place appointed by the Directors, and in case of default to pay interest for the same at such rate as the Directors shall fix, not exceeding £10 per cent. per annum from the day appointed for payment thereof to the time of the actual payment, and joint holders of Shares shall be so liable severally as well as jointly in respect of all Calls thereon and interest.

17. The Directors may, if they think fit, receive from any Member willing to advance the same, all or any part of the moneys unpaid upon the shares held by him beyond the sums actually called up, and the moneys so paid in advance or so much thereof as shall, from time to time, exceed the amount of the Calls then made upon the Shares in respect of which such advance shall have been made, may be treated as loans, at such interest, and on such terms, as the Members paying such sums in advance and the Directors shall agree upon.

# LIEN ON SHARES.

18. The Company shall have a first charge or paramount lien upon all Shares for all moneys due to it from and for all engagements with the holder or any of the joint holders thereof, either alone or jointly with any other person, whether the period for the payment, fulfilment or discharge thereof shall have actually arrived or not, including all Calls, the resolutions for which shall have been passed by the Directors, although the times appointed for their payment may not have arrived.

19. Such lien may be made available by a sale of all or any of the Shares subject to it, provided that no such sale shall be made except under a resolution of the Directors, and until notice in writing shall have been given to the indebted Member or his executors or administrators, or the trustee in his Bankruptcy, requiring him or them to pay the amount for the time being due to the Company, and default shall have been made for twenty-eight days from such notice in paying the sum thereby required to be paid.

20. In case of such sale the Directors shall apply the clear proceeds, after the payment of any expenses, in or towards the satisfaction of such debts or engagements, and the residue (if any) shall be paid to such Member, his executors, administrators, or assigns.

# FORFEITURE OF SHARES.

31. If any member fails to pay any Call or other money payable in respect of a Share on the day appointed for payment thereof, the Directors may at any time thereafter during such time as the Call or other money shall remain unpaid, serve a notice on him requiring him to pay the same, together with the interest that may have accrued, and any expenses that may have been incurred by the Company by reason of such non-payment.

32. The notice shall name a further day not less than twenty-one days after the day first appointed, on or before which such Call or other money, and all interest and expenses incurred by reason of such non-payment are to be paid. It shall also name the place where payment is to be made; the place so named being either the registered office of the Company, or some other place at which the Calls of the Company are usually made payable. The notice shall also state that in the event of non-payment at or before the time and at the place appointed, the Shares in respect of which such Call or other money may be payable, will be liable to be forfeited.

33. If the requisitions of any such notice as aforesaid be not complied with, any Share in respect of which such notice shall have been given, may at any time thereafter before payment of all Calls or other moneys, interest and expenses due in respect thereof shall have been made, be forfeited by a resolution of the Directors to that effect.

34. Any forfeited Shares shall be deemed to be the property of the Company, and may be sold, re-allotted, or disposed of in such manner as the Directors shall think fit.

35. Any Member whose Shares have been forfeited, shall, notwithstanding, be liable to pay to the Company all Calls or other moneys and expenses owing upon or in respect of such Shares at the time of forfeiture, together with interest thereon.

36. A certificate in writing under the seal of the Company and the hands of two Directors, and countersigned by the secretary, that a Share has been duly forfeited, in pursuance of the regulations of the Company, or sold under Article 12, shall be conclusive evidence of such forfeiture or sale, as the case may be, and also in favour of the purchaser of its regularity and validity, so that the remedy of any person aggrieved shall be against the Company, and in damages only, and an entry of every such Certificate shall be made in the minutes of the proceedings of the Directors, and such certificate and the receipt of the Company, for the price of such Share shall constitute a good title to such Share.



27. On any sale by the Directors of forfeited Shares, or of Shares sold under Article 19, the purchaser shall be registered as the Proprietor of the Shares, and shall receive a Certificate of such Proprietorship; under Article 7, and shall hold the Shares discharged from all Calls due prior to his purchase; and he shall not be bound to see to the application of the purchase-money.

28. The Directors may, at any time, before any Shares so forfeited shall have been sold, realised, or otherwise disposed of, in their discretion, remit or annul the forfeiture thereof, upon payment of all moneys due to the Company from the late holder of such Share, and all expenses incurred in relation to such forfeiture, or generally upon such terms as they shall seem fit.

#### GENERAL MEETINGS.

29. The first Ordinary General Meeting shall be held at such time, within four months after the incorporation of the Company, and at such place as the Directors may determine. The subsequent Ordinary General Meetings shall be held once, at least, in each year, at such time and place as the Directors may determine.

30. The Directors may, whenever they think fit, and they shall, upon a requisition, made in writing, by five Members of the Company holding, in the aggregate, Shares to the nominal amount of £10,000 of the issued Capital for the time being of the Company, convene an Extraordinary General Meeting.

31. Any such requisition shall express the object of the meeting proposed to be called, and shall be left at the registered Office of the Company.

32. Upon receipt of such requisition, the Directors shall forthwith proceed to convene an Extraordinary General Meeting. If within fourteen days from the receipt of the requisition they do not proceed to convene such Extraordinary General Meeting, the requisitionists, or any other five Members holding the required amount of Shares, may themselves convene the same; but no such requisition shall remain in force for more than two calendar months from the time when the same shall be deposited at the office.

33. The Directors or Members convening any meeting shall give fourteen days' notice, at least, specifying the place, the day, and the hour of meeting, and, in case of special business, the general nature of such business, to the Members, in manner hereinafter mentioned, or in such other manner (if any) as may be prescribed by the Company in general Meeting; but the non-receipt of such notice by, or the accidental omission to give any such notice to, any member, shall not invalidate the proceedings.

at any general Meeting. Whenever any meeting is adjourned for twenty-one days or more, at least five days' notice of the place and hour of meeting of such Adjourned Meeting shall be given in a like manner.

34. All business shall be deemed special that is transacted at an Extraordinary Meeting, as well as all business that is transacted at an Ordinary Meeting, with the exception of choosing a Chairman (if necessary), sanctioning a Dividend, electing Directors and Auditors, and other officers in the place of those retiring by rotation, and voting their remuneration, considering the accounts and the report of the Directors, and passing any resolution relating to or arising out of the subject matter of such report.

#### PROCEEDINGS AT GENERAL MEETINGS.

35. No business shall be transacted at any General Meeting, except the choice of a Chairman (if necessary), and the declaration of a Dividend, unless five Members shall be present in person or by proxy at the time when the meeting proceeds to such business.

36. If within half-an-hour from the time appointed for the meeting, a quorum (as defined by the clause immediately preceding) be not present, the meeting, if convened upon the requisition of Members, shall be dissolved. In any other case it shall stand adjourned to the same day in the next week, at the same time and place; and if at such Adjourned meeting a quorum be not present, it shall be adjourned sine die.

37. The Chairman (if any) of the Board of Directors shall preside as Chairman at every general Meeting of the Company.

38. If there be no such Chairman, or if at any meeting he is not present within fifteen minutes after the time appointed for holding the meeting, or be unwilling to act, the Directors present shall choose one of their own number to act as Chairman, and that, failing, the Members present and entitled to vote shall appoint some one of their own number to be Chairman.

39. The Chairman may, with the consent of the meeting, adjourn any meeting from time to time and place to place, but no business shall be transacted at any Adjourned Meeting other than the business left unfinished at the meeting from which the adjournment took place.

40. At any general Meeting, unless a poll is demanded by at least three of the Members holding in the aggregate fifty Shares and present in person or by proxy and entitled to vote, a declaration by the Chairman that a

resolution has been carried and an entry to that effect in the Company's Books, shall be sufficient evidence of the fact without proof of the number or proportion of votes recorded in favour of or against such resolution.

41. If a poll is demanded by three or more Members holding in the aggregate fifty Shares, and present in person or by proxy, and entitled to vote, it shall be taken in such manner and at such time and place as the Chairman directs, and the result of such poll, as declared by the Chairman, shall be conclusive, and shall be deemed to be the resolution of the Company in General Meeting.

42. Minutes shall be made in books provided for the purpose, of all resolutions and proceedings of General Meetings, and any such minutes if signed by any person purporting to be the Chairman of the meeting to which they relate, or by any other person present thereat, and appointed by the Board of Directors to sign the same in his place, shall be receivable as evidence of the facts therein stated, without further proof; but if such minutes were signed otherwise than by the Chairman of the meeting to which they relate, they shall be read to the next succeeding General Meeting, and on being found or made correct shall be signed by the Chairman thereof.

#### VOTES OF MEMBERS.

43. Every Member shall have one vote for every A Share held by him, and one vote for every two B Shares held by him. In case of an equality of votes, the Chairman shall, in addition to the votes to which he otherwise may be entitled, have a casting vote.

44. If two or more persons are jointly entitled to a Share or Shares, the Member whose name stands first in the Register of members, as one of the holders of such Share or Shares, and no other, shall be entitled to vote in respect of the same.

45. If any Member is an infant, minor, married woman, not having her Shares registered in her own name under "The Married Woman's Property Act, 1870", lunatic, or person of unsound mind, he or she may attend General Meetings and vote by his or her guardian, tutor, husband, committee, or legal curator, or by any one of them, if more than one, such person having at least twenty-four hours before the time of holding such meeting, furnished to the Directors such evidence as they shall require of his title to represent such Member, unless the Directors shall have previously by resolution admitted his right to vote at such meeting in respect thereof, and Members attending General Meetings by such representatives shall be deemed personally present.

46. No member shall be entitled to vote on any question at any general Meeting or upon a poll, or be reckoned in a quorum, whilst any Call or other sum shall be due and payable to the Company in respect of any of the Shares of such Member, and no Member shall be entitled to vote in respect of any Share that he has acquired by transfer, unless he has been registered as the owner of such Share in respect of which he claims to vote for at least one month previously to the time of holding the meeting at which he proposes to vote.

47. Votes may be given either personally or by proxy. No person shall be appointed a proxy who is not a Member of the Company and qualified to vote.

48. The instrument appointing a proxy shall be deposited at the registered Office of the Company not less than twenty-four hours before the time for holding the meeting at which the person named in such instrument proposes to vote.

49. The instrument appointing a proxy shall be in the following form with such variations as circumstances may require.

THE EDISON ELECTRIC LIGHT COMPANY, LIMITED.

I, \_\_\_\_\_ of \_\_\_\_\_ being a Member of the EDISON ELECTRIC LIGHT COMPANY, LIMITED, hereby appoint (being likewise a Member of the Company) as my proxy to vote for me and on my behalf as holder of \_\_\_\_\_ Shares at the (Ordinary or Extraordinary as the case may be) General meeting of the Company, to be held on the \_\_\_\_\_ day of \_\_\_\_\_ and at any adjournment thereof.

As witness my hand this \_\_\_\_\_ day of \_\_\_\_\_ 188

DIRECTORS.

50. The qualification of a Director shall be the holding in his own right of not less than 500 A or B Shares of the Company.

51. The number of Directors shall not be less than five, nor more than seven; but this clause shall be construed as being only directory, and the continuing Directors may act, notwithstanding any number of vacancies.

52. The first Directors shall be -

VISCOUNT ANSON.

SHELFORD BIDWELL

The Right Hon. EDWARD PLEYDELL BOUVERIE

Sir JOHN LUBBOCK, Bart, M.P., and

RICHARD BLANEY WADE .

and they shall hold office until the First Ordinary Meeting in the year 1883, until which time the Directors for the time being may add any qualified Members to their number, so that there be not more than seven Directors in all at any time. The said Edward Pleydell Bouverie shall be the first Chairman of the Board.

53. The annual remuneration of the Chairman shall be £500, and the annual remuneration of the other Directors shall be the sum necessary to provide £300 for each. Such remuneration shall be divided among the Directors (other than the Chairman) as regards one moiety in proportion to their attendance, and as regards the other moiety in equal amounts, unless the Board shall otherwise determine. Should the amount actually paid as dividend out of the profits of any year exceed £10 per cent. to the "A" Shareholders and £5 per cent. to the "B" Shareholders, a sum equal to 10 per cent. of the excess shall be paid by way of further remuneration to the Board of that year, to be divided between them as they may think fit; but in no case shall the entire remuneration of the Board (including the Chairman) for any one year exceed £5,000.

54. If any Director shall be called upon to go or reside abroad on the Company's business, or otherwise to perform extra services, the Board may arrange with such Director for such special remuneration for such services, either by way of salary, commission, or the payment of a stated sum of money, as they shall think fit.

#### POWERS OF DIRECTORS.

55. The business of the Company shall be managed by the Directors, who may exercise all such powers of the Company as are not by any Act of Parliament, or by these Articles, required to be exercised by the Company in General Meeting, subject nevertheless to any regulations of these Articles, to the provisions of any Act of Parliament, and to such regulations not being inconsistent with the aforesaid regulations or provisions, as may be prescribed by the Company in General Meeting; but no regulation made by the Company in General Meeting shall invalidate any prior act of the Directors which would have been valid if such regulation had not been made, and the generality of the powers hereby conferred upon the Directors shall not be limited by any subsequent clause or proviso conferring any express power.

56. In furtherance, and not in limitation of, and without prejudice to the general powers conferred or implied in the last preceding Article, and of the other powers conferred by these presents, the Directors shall be entrusted with, and may perform the following powers and duties:-

- (a) They may take such steps as they think fit to carry into effect the said Agreement mentioned in the Memorandum of Association, and they may pay the costs, charges, and expenses, preliminary and incidental to the formation, establishment, and registration of the Company.
- (b) They may also appoint, and at their discretion remove or suspend such Managers, Secretaries, Officers, Clerks, Agents, and Servants for permanent, temporary, or special services, as they may from time to time think fit, and may determine their duties, and fix their salaries or emoluments, and may require security in such instances, and to such amount as they think fit.
- (c) They may act on behalf of the Company in all matters relating to bankrupts or insolvents.
- (d) They may appoint any person or persons to accept and hold in trust for the Company any property belonging to the Company, or in which it is interested, and may execute and do all such deeds and things as may be requisite to vest the same in such person or persons.
- (e) They may also compound, abandon or refer to arbitration any claims or demands by or against the Company, and observe and perform the award.
- (f) They may also make and give receipts, releases, and other discharges for moneys payable to the Company, and for the claims and demands of the Company.
- (g) They may invest any of the funds of the Company (not immediately required for the purposes thereof) upon such security other than the Shares of the Company, and in such manner as they may think fit, and they may from time to time vary or realize such investments.
- (h) They may from time to time make, vary, and repeal bye-laws for the regulation of the business of the Company, its Officers and Servants, or the Members of the Company, or any section thereof.
- (i) They may also enter into all such negotiations and contracts and rescind and vary all such contracts and execute and do all such acts and deeds and things, in the name and on behalf of the Company, as they may consider expedient for, or in relation to, any of the measures aforesaid or otherwise for the purposes of the Company.

- (j) They may establish Branch Offices, Agencies, or Local Boards in the United Kingdom or elsewhere, and may make such regulations for their management as they may from time to time think proper, and for that purpose may appoint such Local Directors, Managers, Agents, Officers, Clerks and Servants, with such remuneration and at such salaries as they may consider advisable, and may pay the expenses occasioned thereby out of the funds of the Company, and may from time to time discontinue all or any of such Branch Offices, Agencies, or Local Boards, and may remove or suspend all or any of the Local Directors, Managers, Agents, Officers, Clerks, or Servants for such reasons as they may think proper and advisable, and without assigning any cause.
- (k) They may from time to time raise or borrow, for the purposes of the Company, such sums of money as they may think proper. All money borrowed for the purposes of the Company may be raised by a mortgage of the whole or any part of the Company's property, including Letters Patent and the Company's Capital, whether called up or not, or other property, or by Debentures, or upon such other security and upon such terms as the Directors may think fit.
- (l) They may by such signature or signatures of any one or more of their number as may be fixed from time to time by resolution of the Board, with the count or signature of the Secretary of the Company, draw, accept, make, and endorse Bills of Exchange and Promissory Notes on behalf and for the purposes of the Company, and also execute under the seal of the Company, and issue Debenture Bonds or other obligations. Every instrument to which the seal of the Company shall be affixed shall be signed by two Directors, and be countersigned by the Secretary or other Officer appointed by the Board.
- (m) They may purchase for Shares or such other consideration as they may think fit, and upon any terms the business, goodwill and property, or either of them, or any part thereof respectively, of any Company (whether in liquidation or not), or other person or persons whatsoever carrying on any business comprised in the objects of the Company, and under the authority of an Extraordinary resolution may sell to any Company carrying on or formed for carrying on the like businesses, or any or either of them, for Shares therein to be distributed among the Members, or otherwise the business, estate, and effects of the Company, and shall have power to do all such things as may be necessary for carrying any such sale or transaction as aforesaid into effect, and in case any contract entered into by the Directors for such purposes as aforesaid involves the dissolution of the Company, the Company shall thereupon be dissolved.

57. "The Company shall have power to use official Common Seals under "The Companies' Seals Act, 1864", in such foreign countries as the Directors shall determine, and the Directors shall have power to appoint any Agents, or Agent, Committees;

or Committee abroad to be duly authorized agents of the Company for the purpose of affixing and using such Foreign Common seals, and they may impose such restrictions on the use thereof as they shall think fit.

#### DISQUALIFICATION OF DIRECTORS.

58. The Office of a Director shall be vacated:-

(1) If he ceases to hold the due qualification or if his removal be decided upon by a resolution of an Extraordinary General Meeting.

(2) If he becomes of unsound mind or bankrupt, or suspends payment, or files a petition for the liquidation of his affairs, or compounds with his creditors, or is convicted of a misdemeanor or felony.

(3) If he shall send in his resignation in writing to the Directors, and the same shall be accepted by the Board, or be not withdrawn for the space of fourteen days.

59. All acts done at any meeting of the Directors or of a Committee of Directors, or by any person acting as a Director, shall be valid, notwithstanding that it be afterwards discovered that there was some disqualification or defect in the appointment of any Directors, or of any person or persons acting as aforesaid, or that they or any of them were disqualified.

#### ROTATION OF DIRECTORS.

60. At the Ordinary Meeting to be held in the year 1883 and at the Ordinary meeting in every subsequent year, one third of the Directors for the time being or the nearest number to one third shall retire from office.

61. The one third or other nearest number of such Directors as aforesaid to retire in any year shall always be those who have been longest in office, and in case of equality in that respect they shall, unless the Directors agree among themselves, be determined by lot. A retiring Director may be re-elected.

62. The Company may, by a resolution of an Extraordinary General Meeting, remove any Director before the expiration of his term of office, and may by an ordinary resolution appoint another person in his stead. The person so appointed shall hold office only for so long as the Director removed would, except for such resolution, have held the same.

63. The Company at the general Meeting, at which any such Directors as aforesaid retire in manner aforesaid, shall fill up the vacated offices by electing a like



number of persons, unless it be necessary to elect more or fewer, in order to give effect to a resolution for altering the number of Directors.

64. If at any meeting at which an election of Directors ought to take place as aforesaid, the places of the retiring Directors are not filled up, the meeting shall stand adjourned till the same day in the next week, at the same time and place, and if at any such Adjourned Meeting, the places of such retiring Directors are not filled up, such retiring Directors or such of them as have not had their places filled up, shall continue in office until the Ordinary Meeting in the next year, and so on from time to time until their places are filled up, unless it shall be determined at such meeting to reduce the number of Directors.

65. The Company may from time to time in General Meeting increase or reduce the number of Directors.

66. Any casual vacancy occurring in the Board of Directors may be filled up by the Directors, but any person so chosen shall retain his office so long only as the vacating Director would have retained the same, if no vacancy had occurred.

#### PROCEEDINGS OF DIRECTORS.

67. The Directors may meet together for the dispatch of business, adjourn and otherwise regulate their meetings as they think fit, and determine the quorum necessary for the transaction of business both by Board and Committees, until otherwise fixed the quorum for a Board Meeting shall be three Directors.

68. Questions arising at any Meeting of the Directors shall be decided by a majority of votes. In case of an equality of votes the Chairman of such Meeting shall have a second or casting vote.

69. A Director may at any time summon a Meeting of the Directors.

70. The Directors may elect a Chairman of their Meetings and determine the period for which he is to hold office, but if no Chairman be elected, or if at any Meeting the Chairman be not present at the time appointed for holding the same, the Directors present shall choose some one of their number to be Chairman of such Meeting.

71. The Directors may delegate any of their powers to Committees, consisting of such members of their body as they think fit. Any Committee so formed shall, in the exercise of the powers so delegated, conform to any regulations that may be imposed on it by the Directors.

72. A Committee may elect a Chairman of their Meetings. If no such Chairman be elected, or if he is not present at the time appointed for holding the same, the Members present shall choose one of their number present to be Chairman of such meeting.

73. A Committee may, subject to any regulation made by the Board, meet and adjourn as they may think proper. Questions at any meeting shall be determined by a majority of votes of the Members present, and in case of an equal division of votes, the Chairman shall have a casting vote.

74. The Directors shall keep an attendance book, in which each Director present at any meeting of Directors or Committee of Directors shall sign his name.

75. The Directors shall cause minutes to be made in books provided for the purpose:-

- (1) of all appointments of Officers made by the Directors, and of their salary and remuneration.
- (2) Of all orders made by the Directors, or by Committees of Directors, and
- (3) Of all resolutions and proceedings of General Meetings, and of Meetings of the Directors and Committees of Directors.

And any such minute as aforesaid, if signed by any person purporting to be the Chairman of such meeting, or by the Chairman of the next succeeding meeting, shall be receivable in evidence without any further proof.

76. The Common seal of the Company shall be kept by the secretary at the Company's registered Office, and shall be under the sole control of the Directors, and shall be employed only in pursuance of a resolution of the Board of Directors.

#### DIVIDENDS, RESERVE FUND, &C.

77. No Dividend shall be payable except out of the balance standing to the credit of profit and loss at the end of the year in respect of which it is declared, or in excess of the amount from time to time recommended by the Board of Directors.

78. The amount from time to time recommended by the Board of Directors for payment of Dividends shall be applied, Firstly, in payment of a preferential cumulative Dividend

at the rate of 25 per cent. per annum on the amount for the time being paid up or credited as paid up on the A shares, and Secondly, in payment of a Dividend pari passu on the amounts paid up or credited as paid up upon the A and B shares.

79. The Directors may of their own authority, but only out of what they deem to be the profits arising from the business of the Company, from time to time pay to the members a sum on account of Dividend at such rate as they shall think fit.

80. The Directors shall in priority to any Dividend set aside out of the profits of the Company such sums as they think proper for bad debts or losses, or for the depreciation, repairing or maintaining of any of the property of the Company, or meeting any other contingencies or purposes of the Company, and may apply the same accordingly, and in the meantime may invest any sums so set aside in or on such securities as they may select other than the Shares of the Company.

81. The Directors may deduct from the Dividends payable to any Member all such sums of money as may be due from him to the Company on account of Calls or otherwise.

82. Notice of any Dividends that may have been declared or be payable shall be given to each Member in manner hereinafter mentioned, and no Dividend shall bear interest as against the Company.

#### ACCOUNTS.

83. The Directors shall cause true accounts to be kept of the Company's business and transactions and of all sums of money received and expended by the Company and the matters in respect of which such receipt and expenditure take place, and of the credits, assets, and liabilities of the Company. In ascertaining the balance of the Profit and Loss Account for the purposes of the said Agreement, or of any division of profits, the said account shall be debited with all expenses and outgoings chargeable in respect of the period over which such account extends, whether they have been actually paid or exist only as liabilities of the Company, as well as with a proper amount in respect of depreciation, and shall be credited with all earnings and income accrued within the said period.

84. A statement of the Company's financial position shall be laid before every Ordinary General Meeting to be held after the year 1882, made up to a date not more than three months before such meeting.

## AUDIT.

85. Once in every year, namely, preparatory to each Ordinary General Meeting, the accounts of the Company shall be examined, and the correctness of the Financial Statement ascertained by one or more Auditor or Auditors.

86. The first Auditor or Auditors shall be appointed by the Directors, and subsequent Auditors shall be from time to time annually appointed by the Company in General Meeting.

87. The Auditors need not, but may be Members of the Company; and no Director or other Officer of the Company shall be eligible during his continuance in office.

88. The remuneration of the Auditors shall be fixed by the Directors.

89. Any Auditor shall be re-eligible on his quitting office.

90. If any casual vacancy occurs in the office of Auditor, the Directors shall forthwith fill up the same.

91. In case at any time there shall be a total failure of Auditors appointed in manner aforesaid, and no Extraordinary General Meeting shall have been called during one week for the purpose of supplying such failure, the Board of Trade may on the application of not less than five members of the Company appoint any Auditor for the current year, and fix the remuneration to be paid to him by the Company for his services.

92. Every Auditor shall be supplied with a copy of the Financial statement, and it shall be his duty to examine the same with the accounts and vouchers relating thereto.

93. Every Auditor shall have a list delivered to him of all books kept by the Company, and shall at all reasonable times have access to the books and accounts of the Company.

94. The Auditors shall report to the members upon the Financial Statement, and they may give such information to the Members on the state of the Company's affairs as they may think fit.

## NOTICES.

95. A notice may be served by the Company upon any Member, either personally or by sending it through the post in a prepaid letter, addressed to such Member at his registered place of abode.

96. All notices directed to be given to the Members shall, with respect to any Share to which persons are jointly entitled, be given to whichever of such persons is named first in the Register of Members, and notice so given shall be sufficient notice to all the holders of such Share.

97. Any notice if served by post shall be deemed to have been served on the day following that on which the letter containing the same was posted, and in proving such service it shall be sufficient to prove that the letter containing the notice was properly addressed and put in the Post Office.

98. Any Member residing out of the United Kingdom may name an address within the United Kingdom at which all notices shall be served upon him, and all notices served at such address shall be deemed to be well served. If he shall not have named such an address he shall not be entitled to any notices.

## AGREEMENT.

99. The Company ratifies and adopts the Agreement mentioned in the Memorandum of Association, and the Directors shall forthwith do all acts necessary for carrying the same into full effect, subject to any modifications which may be agreed upon between the Board and the said THOMAS ALVA EDISON and the said Drexel Morgan & Company.

## INTERPRETATION CLAUSE.

100. In the interpretation of these Articles the following words and expressions shall have the following meanings, unless excluded by the subject or context:-

"Month" shall mean calendar month.

Words importing the singular number only shall include the plural.

Words importing the plural number only shall include the singular.

Words importing the masculine gender shall include the feminine.

The word "Bankruptcy" shall include liquidation by arrangement under "The Bankruptcy Act, 1868".

NAMES, ADDRESSES AND DESCRIPTIONS OF SUBSCRIBERS.

Edward Pleydell Bouverie  
44 Villa Crescent, Westminster

John Lubbock, High Elm, Down, Kent  
M.P.

Howard Gilliat  
4 Crosby Square, London, E.C.  
Merchant

William Cair Batham, 2 Fenchurch Corner  
Merchant

Wm. Fowler, 38 Grosvenor Square, London, M.P.

Frederick Joseph Bramwell, F.R.S.  
37 Great George st., S.W.  
Engineer

Edward Hibberd Johnson  
57 Holborn Viaduct  
Electrical Engineer

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Dated the 15 day of March 1882

Richard L. Harrison  
Solicitor

Clerk to Messrs. Waterhouse & Winterbotham  
1 New Court  
Lincolns Inn W.C.  
Solsrs.

## THE SCHEDULE BEFORE REFERRED TO.

A N A G R E E M E N T dated the 18th day of February 1889 and made between THOMAS ALVA EDISON of Menlo Park, New Jersey, U.S.A. of the first part DREXEL MORGAN AND COMPANY of New York, U.S.A. of the second part EGISTO PAOLO FABBRI of New York aforesaid and GROSVENOR PORTER LOWREY also of New York aforesaid of the third part and THE RIGHT HONORABLE EDWARD PLEYDELL BOUVIERIE and the other persons whose names appear at the foot hereof opposite the number of shares to be subscribed for by them in the Company hereinafter mentioned of the fourth part.

WHEREAS the said Thomas Alva Edison is the owner of the Patents specified in the Schedule hereto subject to certain rights therein of the parties hereto of the second and third parts. NOW IT IS HEREBY AGREED AND DECLARED by and between the parties hereto as follows that is to say:-

1. The parties hereto of the fourth part will within two months after the execution of this Agreement by the parties hereto of the first three parts form a Company to be registered under the Companies Acts 1862 to 1880 with liability limited by shares and to be called The Edison Electric Light Company Limited for the purpose (inter alia) of purchasing and acquiring the said Patents and adopting this Agreement and the parties hereto of the fourth part will subscribe for the number of A shares in the said Company set opposite their names respectively and will not part with such shares or any of them during the first year after the formation of the company. The Company shall commence its business immediately after its incorporation.

2. Drexel Morgan & Co. will subscribe for 5,000 A shares in the said Company and will not part with such shares or any of them during the first year after the formation of the company.

3. The Capital of the Company shall be £1,000,000 divided into 50,000 A Shares of £10 each and 50,000 B Shares of £10 each with power to increase the Capital beyond £1,000,000 so that all such increased Capital be divided into an equal amount of A Shares and B shares.

4. The yearly profits of the company available for Dividend shall be applied:-

Firstly- In payment of a preferential cumulative Dividend of £5 per cent. per annum on the amount for the time being paid up or credited as paid up on the A Shares, whether part of the original or of any increase of Capital.

Secondly- In payment of a Dividend pari passu on the amounts paid up or credited as paid up on the A and B shares of whatever issue.

In the event of the winding up of the company the repayment of the amount paid up or credited as paid up on the A shares of whatever issue with any arrears of the cumulative Dividend of 25 per cent. thereon shall have priority. Any further surplus of assets shall be distributed over the A and B shares of whatever issue in proportion to the amount paid up or credited as paid up thereon i.e. such surplus shall be distributed as to one-half among the A shares and as to the other half among the B shares.

5. The voting power shall be as follows:- 1 vote for each A share and 1 vote for every 2 B shares.
6. The qualification for a Director unless otherwise altered by special resolution shall be the holding of 500 A or B shares
7. 90,000 A shares shall be first issued and actually subscribed for within 91 days after the formation of the company and 25 per share shall be paid up thereon within 14 days after the issue thereof.
8. The said Thomas Alva Edison with the concurrence of the parties hereto of the second and third parts will sell and assign to the company (1) the several Patents specified in the Schedule hereto being the whole of the Patents taken out by him or on his behalf in relation to the application of electricity or magnetism as a lighting heating and motive agent and (2) all electric lamps dynamos and other plant belonging to them or any of them now in Great Britain and used or capable of being used for the exhibition of the said Patents or the production of electric light and the lease of No. 57, Holborn Viaduct.
9. The Company shall be entitled without further payment than is hereinafter mentioned to all extensions of the said Patent rights and to all improvements which may be made by the said Thomas Alva Edison upon or connected with the said inventions so far as the said extensions and improvements may relate to the application of electricity or magnetism as a lighting heating and motive agent. The said Thomas Alva Edison shall be entitled to receive from the Company all expenses incurred by him in experiments leading up to such improvements after he shall have taken out Letters Patent for the same in Great Britain with 100 per cent. added without reference to the amount of any remuneration which the said Thomas Alva Edison may receive from other persons and shall also be entitled to receive from the Company the amount of all expenses and fees necessary for obtaining and keeping up such last mentioned Letters Patent. The said Thomas Alva Edison shall with all reasonable speed after making any such improvement and taking out Letters Patent for the same inform the Company thereof and of the amount of the expenses alleged by him to have been incurred in experiments as aforesaid and in obtaining and keeping up such Letters Patent and if the Company shall within three calendar months after the receipt of such notice elect to acquire the improvement referred to in such notice the amount to be paid by the Company under this clause shall in case of difference be fixed by arbitration in the usual way but if the Company shall not within the said period of three calendar months elect to acquire the same the Company's rights under this clause to such improvement shall cease.



10. The consideration to be paid by the Company for the said Patents and plant shall be (First) a sum not exceeding £30,000 cash to be paid to the parties hereto of the second part in respect of the actual expenditure in England on the part of the parties hereto of the first three parts with reference to the said patents plant business and lease up to this time. (Secondly) The allotment to the said T. A. Edison of one fully paid-up B share for every £10 of capital actually paid up or credited as paid up in respect of A shares of whatever issue. Every such allotment to the said T. A. Edison of B shares of whatever issue shall be made within one calendar month after every such sum of £10 shall be actually paid up or credited as paid up. All necessary contracts shall be from time to time executed by the Company in order to enable the said T. A. Edison to register the same prior to the issue of the shares to be allotted to him as aforesaid.

11. The said T. A. Edison will not without the consent of the Company before the year 1890 part with one fifth part of the B shares which may be from time to time allotted to him and the Company may refuse to register any transfer of such shares executed contrary to this clause.

12. The Company shall pay to the parties hereto of the second part on the execution and delivery to it of the necessary assignment or assignments of the said Patents the sum of £30,000.

13. The certificates of one half of the B shares for the time being allotted to the said Thomas Alva Edison or his nominee shall be retained by the Company and no dividends shall be actually paid in respect of such one-half of the B shares until the dividends which would otherwise have been payable in respect thereof shall have made up the said sum of £30,000 so paid as aforesaid interest being computed on the account at the rate of 25 per cent. per annum with yearly rests.

14. In no event shall any claim be made against any of the parties hereto of the first three parts for the return of any part of the said sum of £30,000 or any interest thereon but the said sum when repaid or satisfied by the means aforesaid shall not be deemed income of the Company.

15. The Company will immediately after the assignment or assignments of the said Patents grant to the said Thomas Alva Edison or his nominee free and exclusive licences to use all or any of the said Patents or any improvements thereof for the purpose of locomotion only on railways or tramways or on common roads and for all other purposes except the application of electricity or magnetism as a lighting or heating agent or as a motive agent otherwise than for the purpose of such locomotion as above expressly specified. And every such licence shall contain such negative and other covenants by the Company as may be necessary or proper for protecting the said T. A. Edison or his nominee in the enjoyment of such free and exclusive licences.

16. The said Thomas Alva Edison will from time to time with all reasonable despatch supply to the Company at the prices charged by him to his most favoured customer (such prices not to exceed 50 cents each for isolated business and 40 cents each where the lamps are to be used in connection with central lighting stations) all such electric lamps as shall be required by the Company for the purpose of their operations. The said T. A. Edison will until January 1st 1888 with all reasonable despatch regard being had to the capacity of his works and his other engagements supply to the Company at the prices charged by him to his most favoured customers all such dynamos and other plant as shall be required by the Company. All such lamps dynamos and plant to be delivered to the order of the Company at the place of manufacture and to be paid for in cash and if so required to be packed and shipped by the said T. A. Edison as the agent and at the cost of the Company. But the Company shall not be bound to purchase from the said Thomas Alva Edison except that the Company shall within one month after its incorporation purchase of the said Thomas A. Edison electric lamps dynamos and other plant to the extent of \$20,000 at the prices charged to his most favoured customer.

17. If the Company shall not be incorporated within the said period of two calendar months or if the first issue of A shares shall not be actually subscribed for within the said period of 21 days or if 25 per share shall not be paid up thereon within 14 days after the issue thereof then and in any of such cases this Agreement and everything herein contained shall be void.

18. The said parties hereto shall at the expense of the Company enter into and execute and procure the execution by all other proper parties of all such further deeds and agreements as may be necessary to give full effect to the provisions of these presents and in the event of any difference as to what shall be contained in such further deeds and agreements or in reference to the carrying into effect of any clause of these presents the same shall be referred to the decision of two or more responsible persons to be appointed in the usual way one by each of the parties to the difference or their umpire.

19. This Agreement may be modified from time to time after the formation of the Company with the consent of the said Thomas Alva Edison and of Drexel Morgan & Co. and of the Company.

20. All B shares of whatever issue shall be delivered to Drexel Morgan & Co. except that the one-fifth part thereof which is to remain untransferred under clause 11 may after issue be retained by the Company until the year 1880.

IN WITNESS whereof the said parties to these presents have hereunto set their hands the day and year first above written.

## SCHEDULE OF PATENTS.

	No. of Patent.	Date	In whose Name taken out.
1.	4286	Oct. 33, 1878	T. A. Edison
2	4502	Nov. 7 "	E. G. Brewer
3	5306	Dec. 28 "	T. A. Edison
4	2403	June 17, 1879	"
5	4576	Nov. 10 "	"
6	5127	Dec. 15 "	"
7	33	Jan. 3 1880	"
8	578	Feb. 10 "	"
9	602	Feb. 11 "	"
10	1385	April 5 "	"
11	3765	Sept. 16 "	E. G. Brewer
12	3880	Sept. 24 "	P. Jensen
13	3894	Sept. 25 "	"
14	3964	Sept. 30 "	"
15	4391	Oct. 27 "	"
16	539	Feb. 8, 1881	E. G. Brewer
17	562	Feb. 9 "	P. Jensen
18	788	Feb. 25 "	E. G. Brewer
19	799	Feb. 24 "	P. Jensen
20	1046	March 9 "	E. G. Brewer
21	1240	Mar. 21, "	"
22	1783	April 25 "	"
23	1802	April 26 "	P. Jensen
24	1918	May 3 "	E. G. Brewer
25	1943	May 4 "	"
26	2482	June 7 "	"
27	2492	June 8 "	P. Jensen
28	2495	June 8 "	E. G. Brewer
29	2954	July 6 "	P. Jensen

101b 4

## SCHEDULE OF PATENTS (Contd)

	No. of Patent.	Date	In whose Name taken out.
30.	3231	July 23 1881	E. G. Brewer
31.	3483	Aug. 11 "	"
32.	3604	Sept. 1 "	P. Jensen
33.	3932	sept. 10 "	"
34.	4034	Sept. 19 "	"
35.	4174	Sept. 27 "	E. G. Brewer
36.	4552	Oct. 18 "	P. Jensen
37.	4553	Oct. 18 "	"
38.	4571	Oct. 19 "	E. G. Brewer
39.	4576	Oct. 19 "	"

THOMAS ALVA EDISON  
 DRUXEL MORGAN & CO.  
 EGISTO PAOLO FABBRI  
 GROSVENOR PORTER LOWREY

Signatures of Parties of  
 the Fourth Part.

E. P. BOUVIERE  
 (and others)

No. of Shares

500

REGISTERED

6504

8 MAY 1889

STAMPS

10/- 5/-



A N A G R E E M E N T made the thirty first day of March One thousand eight hundred and eighty two BETWEEN THOMAS ALVA EDISON of Menlo Park New Jersey United States of America of the one part and THE EDISON ELECTRIC LIGHT COMPANY LIMITED (hereinafter called the company of the other part WHEREAS by an Agreement dated the eighteenth day of February One thousand eight hundred and eighty two and made between the said Thomas Alva Edison of the first part Drexel Morgan and Company of the second part Egisto Paolo Fabbri and Grosvenor Porter Lowrey of the third part and the Right Honorable Edward Playdell Bouverie and the other persons whose names appear at the foot thereof opposite the number of shares to be subscribed for by them in the Company (then in course of formation) of the fourth part It was agreed that the capital of the Company should be One Million Pounds divided into Fifty thousand A Shares of Ten pounds each and Fifty thousand B Shares of Ten pounds each as therein mentioned and that the said Thomas Alva Edison with the concurrence of the said parties thereto of the second and third parts should sell to the Company the several Patents specified in the Schedule thereto being patents for the application of electricity or magnetism as a lighting heating and motive agent together with certain electric lamps dynamos and other plant

therein mentioned and that the consideration for the said patents and plant should be (First) a sum not exceeding Thirty thousand pounds Cash and (Secondly) the allotment to the said Thomas Alva Edison of one fully paid up B share of the Company for every ten pounds of Capital actually paid up or credited as paid up in respect of A shares of whatever issue AND WHEREAS the said Company was incorporated on the fifteenth day of March One thousand eight hundred and eighty two NOW THESE PRESENTS WITNESS that it is hereby agreed as follows:-

1. THE Company hereby adopts and confirms the said Agreement of the eighteenth day of February One thousand eight hundred and eighty two and agrees with the said Thomas Alva Edison to be bound thereby and to do and execute all such acts and deeds as by the said Agreement are contracted to be done and executed by the Company.
2. THE said Thomas Alva Edison hereby agrees with the Company to do and execute all such acts and deeds as by the said Agreement are contracted to be done and executed by the said Thomas Alva Edison.
3. THE Company will as part of the consideration for the said sale allot to the said Thomas Alva Edison or his nominees Fifty thousand B shares numbered 1 to 50000 inclusive as fully paid up shares and will make such allotment at the times prescribed by the said Agreement

IN WITNESS whereof the said Thomas Alva Edison hath hereunto set his hand and seal and the said Company have caused their Common seal to be affixed the day and year first above written

SIGNED SEALED AND DELIVERED  
 by the above named Thomas Alva } Thomas Alva Edison  
 Edison in the presence of }

Saul Insall State of New York }  
 Geo. W. Knight City and County of New York }

S E A L  
 of  
 Notary  
 Public.

On this thirty first day of  
 March One thousand eight hundred  
 and eighty two before me personally  
 came Thomas Alva Edison to me known  
 and known to me to be the person  
 described in and who signed the  
 above agreement and acknowledged  
 that he signed the same for the  
 purpose named.

In Testimony Whereof I have hereunto set my hand  
 and affixed my seal of office the day and year  
 last above written.

Walter B. Horn  
 Notary Public

E. P. Bouverie Chairman Edison Electric Light Co. Ltd.

Anson Director ditto  
 T. Molanwhite Secretary ditto

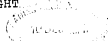
SEAL  
 of  
 Company

7 1 1 7

19 MAY 1882

STAMPS  
250  
10/-

MEMORANDUM of ASSOCIATION  
of the  
SWAN UNITED ELECTRIC LIGHT  
COMPANY, LIMITED.



May 19, 1882

1. The name of the Company is "THE SWAN UNITED ELECTRIC LIGHT COMPANY, LIMITED".

2. The registered office of the Company will be situate in England.

3. The objects for which the Company is established are:-

(A) To adopt and carry out, subject to any modification, the following contracts, viz:-

(1) A contract dated the 16th day of May, 1882, and made between Mr. J.C.Swan, on behalf of the Swan Electric Light Company, Limited, of the one part, and Mr. T.A.Welton, for and on behalf of the Company, of the other part:

(2) A contract dated the 16th day of May, 1882, and made between Mr. J.W.Swan of the one part, and the said Mr. T.A.Welton, on behalf of the Company, of the other part, and to carry on and conduct the whole or any part of the businesses to be acquired under the said two contracts:

(3) A contract dated the 16th day of May, 1882, and made between Mr. R.R.B.Crompton, of the one part, and the said Mr. T.A.Welton, on behalf of the Company, of the other part.

(B) To generate or produce and to store and distribute electricity or electric motive force in any manner, and to use and apply it in or through any means, method, or agency for or to the purposes of lighting or heating, or as a motive power to stationary or locomotive engines or appliances, or for telegraphic or telephonic purposes, or otherwise for transmission of messages, or for electroplating or separating or otherwise working in metals, or for carrying out or facilitating any mechanical operation, or for or to any other purpose whatsoever, whether of the kind or nature of those hereinbefore mentioned, or of a totally different kind or nature:

(C) To contract for the lighting of any public or private place or property by electric or magnetic lights, and to execute all works necessary therefor, and to purchase, manufacture, sell, let, or otherwise



deal in lamps or other appliances in any way directly or indirectly connected with electric or magnetic lights, or any parts thereof:

(D) To manufacture, sell, let, supply, and deal in any cables, wires, instruments or telegraphic or electric materials or appliances:

(E) To establish and maintain centres from which electricity or electric force may be distributed in any way or supplied or used to or for any purpose, and to contract for the performance of any service or the execution of any work which can be effected by electricity or any engine, machine or appliance, moved or acted upon by electricity or electric force:

(F) To establish and carry on any system of transit in which electricity shall be one of the agencies of locomotion, and for such purposes to construct roads or ways of any kind:

(G) To manufacture or acquire, sell, let, or deal in any engines, instruments or appliances for producing, storing, distributing or otherwise dealing with electricity or adapted for the utilisation of electricity as a motive power or otherwise, or which can be used by the Company for any of its businesses:

(H) To take out or acquire by original application, purchase, license or otherwise, any letters patent, patent rights or privileges relating to any invention calculated to be of service to the Company in carrying out any of the objects aforesaid, and to grant any licenses at royalties, or otherwise, for the sale or exercise of any invention or patent right of the Company:

(I) To acquire any concessions, licenses, wayleaves, easements or rights necessary for the carrying on of any business of the Company in any part of the world:

(J) To purchase or take over, or take on lease or otherwise, the whole or any part of any property or undertaking which could, under the powers hereinbefore contained, be owned or worked by the Company, and in connection with any such arrangement to undertake any liability or engagements of the vendors, transferors, or lessors, or to guarantee, in part or altogether, the principal or interest of any funded or other debt, or any dividend upon stock or shares:

(K) To sell or lease the whole or any part of the Company's property, undertaking or business, or any interest therein, for cash or in consideration of any guarantee absolute or contingent in respect of the principal or interest or dividend of or upon its capital or funded debt or any part thereof, or for the shares or obligations of or other interest in any Company having any objects in common with the Company, and either to hold any such shares, obligations or other interests, or distribute the same in specie among the members.

(L) To incorporate the Members as a body, politic or corporate, in accordance with the laws of any State in which the company shall be carrying on or desirous of carrying on business, and to take all steps and to do all things necessary to give the Company, or any company subsidiary thereto, a legal domicile in any State, and otherwise to conform with the requirements of any concession or contract obtained, entered into, or taken over:

(M) To do all or any of the above things in so far as their nature will allow, in any part of the world, and either alone or in conjunction with any State, association or person, and as principals or agents, and to agree for the carrying on of any part of the company's business by contract:

(N) To apply at the cost of the company for any Act or Acts of Parliament to extend the company's powers, or to assist it to carry out anything within its objects:

(O) To do all such other things as are incidental or conducive to the attainment of the above objects.

4. The liability of the Members is limited.

5. The capital of the Company is £1,000,000 divided into 200,000 Shares of £5 each.

WE, the several persons whose Names and Addresses are subscribed, are desirous of being formed into a Company in pursuance of the Memorandum of Association, and we respectively agree to take the number of Shares in the capital of the Company set opposite our respective names.

Names, Addresses, and Descriptions of Subscribers.	Number of Shares taken by each Subscriber.
Charles Morrison 53, Coleman St., London No occupations	100
W.C. Cuilter 14 King's Arms Yard, London, Stockbroker	100
H.H. Dobson 5, Tokenhouse Yard, London Merchant	100
Elton Ellis 20, St. Winchester St. London Merchant	100
G.W. Batt 20, St. Winchester St., London Merchant	100
Charles Waring 10 Victoria Chambers, Westminster Contractor for Public Works	100
Cornelius Cox, 14, King's Arms Yard, London Stockbroker	100

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Dated this 18th day of May, 1882

Witness to the above Signatures  
Frank Crisp  
Solicitor,  
6, Old Jewry, London.

7 1 7 8

19 MAY 1863

STAMPS

10/- 5/-



## ARTICLES OF ASSOCIATION

of the

SWAN UNITED ELECTRIC LIGHT

COMPANY, LIMITED.

It is agreed as follows:-

The regulations contained in Table "A" of the First Schedule to "The Companies' Act, 1863," shall not apply to this company, but the following shall be the regulations of the Company:-

1. The seal of the company shall be affixed to, and the company shall adopt and carry out, subject to any modifications which the Directors may approve, the contracts mentioned in the Memorandum of Association.

## SHARES.

2. Every member shall be entitled to a certificate, under the Common Seal of the company, specifying the Share or shares held by him, and the amount paid up thereon. If such Certificate be worn out or lost, it may be renewed, on payment of one shilling, or such less sum as the Board may prescribe, but the Board may require reasonable evidence of such destruction or loss, and an undertaking by the person applying for such new certificate to indemnify the company against loss by reason of such renewal.

3. If several persons are registered as joint holders of any share, any one of such persons may give effectual receipts for any dividend, bonus, or return of Capital payable in respect of such Share.

4. The Company shall not be bound by or recognise, even though having notice thereof, any right in respect of a Share other than an absolute right thereto in the registered holders thereof for the time being, and the rights in case of transmission hereinafter mentioned.

## CALLS ON SHARES.

5. The Board of Directors, in these Articles called "the Board", may from time to time make such calls as they deem fit upon the Members in respect of all monies unpaid on their shares, provided that twenty one days' notice at least be given of each Call, and each member shall be liable to pay the amount of Calls so made to the persons and at the times and places appointed by the Board.

6. A Call shall be deemed to have been made at the time when the resolution of the Board authorising such Call was passed.

7. If the call payable in respect of any Share or any amount payable on a Share under the terms of allotment be not paid before or on the day appointed for the payment thereof, the holder or allottee of such Share shall be liable to pay interest for the same at any rate fixed by the Board not exceeding ten per cent. per annum or if not rate be fixed at the rate of 6 per cent. per annum from the day appointed for payment to the time of actual payment.

8. The Board may, if they think fit, receive from any Member willing to advance the same, all or any part of the monies due under any of the Shares held by him beyond the sums actually called for, either as a loan repayable or as a payment in advance of Calls, but such advance, if repayable shall, until actually repaid, extinguish so far the liability upon the Shares in respect of which it is received; and upon the monies so received, or so much thereof as from time to time exceeds the amount of the Calls then made upon the shares in respect of which such advance has been made, the company may pay such interest or fixed or other dividend as the member paying the same and the Board agree upon.

#### TRANSFER AND TRANSMISSION OF SHARES.

9. The Transfer of any Share in the Company shall be by instrument in writing, in such form as the board may approve, signed by the transferor and transferee. There shall be paid to the Company in respect of the registration of any transfer or transmission, such fee, not exceeding five shillings, as the Board deem fit.

10. The instrument of transfer shall be presented to the Company at their registered Office in London, accompanied with the certificate of the shares to be transferred, and such evidence as the Board may require to prove the title of the transferor, and thereupon and upon payment of the proper fee, the transferee shall be registered as a member if he be approved by the Board.

11. The Board may, without assigning any reason, decline to register any transfer of Shares to a person not approved by them for the purpose of such transfer, or made by any Member jointly or alone indebted or under any liability to the Company, whether for calls made but not due or otherwise.

12. The Transfer Books may be closed during the fourteen days immediately preceding the Ordinary General Meeting in each year.

13. The executors or administrators of a deceased Member, not being one of several joint holders, and in the case of the death of one of two or more joint holders, the survivor or survivors shall be the only persons recognised by the Company as having any title to his Share or his interest in any Share, but nothing herein contained shall be taken

to release the estate of a deceased joint holder from any liability in respect of any Share jointly held by him.

14. Any person becoming entitled to a Share in consequence of the death or bankruptcy of any Member, or in consequence of the marriage of any female Member, may, if approved by the Board, be registered as a Member upon such evidence of his title being produced as may be required by the Company, or may, instead of being registered himself, execute a transfer of such Share to any person approved by the Board.

#### LIEN.

15. The Company shall have a first and paramount lien on all Shares, and on the interest and dividends declared or payable in respect thereof, for all moneys due to and liabilities subsisting with the Company from or on the part of the registered holder or any of the registered holders thereof, either alone or jointly with any other person, including Calls, the resolutions for which shall have been passed by the Board, although the times appointed for their payment may not have arrived, and may enforce such lien by sale or forfeiture of the Shares on which the same may attach or any part of them. Provided that such forfeiture shall not be made except in the case of a debt or liability, the amount of which shall have been ascertained, and only so many Shares shall be so forfeited as the Auditors of the Company shall certify to be the equivalent of such debt or liability at their then market value.

#### FORFEITURE OF SHARES.

16. If any Member fail to pay any Call, or money payable under the terms of allotment of a Share, on the day appointed for payment thereof, the Board may at any time thereafter during such time as the same remains unpaid serve a notice on him requiring him to pay the same, together with interest and any expenses that may have accrued by reason of such non-payment.

17. The notice shall name a further day on or before which such Call or other money and all interest and expenses that may have accrued by reason of such non-payment are to be paid. It shall also name the place where payment is to be made (the place so named being either the registered Office of the Company or some other place at which Calls of the Company are usually made payable), and shall state that, in the event of non-payment at or before the time and at the place appointed, the Share in respect of which such payment is due will be liable to be forfeited.

18. If the requisitions of any such notice as aforesaid are not complied with, any Share in respect of which such notice has been given may at any time thereafter, before payment of all money due thereon, with interest and

expenses, has been made, be forfeited, by a resolution of the Board to that effect.

19. Any Share forfeited shall be deemed to be the property of the Company, and may be held, extinguished, re-allotted, or disposed of in such manner as the Board think fit. Any forfeiture may be annulled by resolution of the Board.

20. Any member whose Shares have been forfeited shall, notwithstanding, be liable to pay to the Company all Calls or other money owing upon such Shares at the time of the forfeiture.

21. In the case of the sale or re-allotment of a forfeited Share or the sale of any Share to enforce a lien of the Company, a certificate in writing under the Seal of the Company that the Share has been duly forfeited or sold in accordance with the regulations of the Company, shall be sufficient evidence of the facts therein stated as against all persons entitled to such Share, and such declaration and the receipt of the Company for the price of such Share shall constitute a good title to the same, and a certificate of proprietorship shall be delivered to the Purchaser or Allottee, and he shall be registered in respect thereof, and thereupon he shall be deemed the holder of the Share, discharged from all Calls or other money due prior to such purchase or allotment, and he shall not be bound to see to the application of the purchase-money, nor shall his title to the Share be affected by any irregularity in the proceedings in reference to such sale or allotment.

#### SHARE WARRANTS TO BEARER.

22. The Company may issue Share Warrants in respect of paid-up Shares, but no such Share Warrants shall entitle the holder to any rights of voting except such, if any, as previously attached to the Shares. Subject to the provisions of these Articles and of the Companies' Act, 1867, the Bearer of a Share Warrant shall be deemed to be a Member of the Company to the full extent, but he shall not exercise his right, if any, to attend or vote at any General Meeting, or to sign a requisition for, or join in convening a Meeting, under the provisions hereinafter contained, unless he shall have, two clear days previously, deposited the Warrant at the Registered Office of the Company or other place appointed for the purpose by the Board.

23. The stamp duty on every Share Warrant, and all other expenses of or incident to its issue, shall be borne by the person applying for it.

34. In case of the loss of any Share Warrant, a new one may be issued to the person claiming in respect of it, or such person may be satisfied as to the loss of the Warrant, but only on producing such evidence of his title and of the loss of the Warrant as the Board shall consider satisfactory, and on his giving to the Company such indemnity, with or without security, as the Board shall require.

35. The Company may provide by coupons or otherwise for the payment of future dividends on the Shares or Share included in any Share Warrant.

#### CONVERSION OF SHARES INTO STOCK.

36. The Board may, with the sanction of the Company previously given in General Meeting, convert any paid up Shares into Stock. When any Shares have been converted into Stock, the several holders of such stock may thenceforth transfer their respective interests therein, or any part of such interests, in the same manner and subject to the same regulations as and subject to which any Shares in the capital of the Company may be transferred, or as near thereto as circumstances admit.

37. The several holders of stock shall be entitled to participate in the dividends and profits of the company according to the amount of their respective interests in such stock; and such interests shall, in proportion to the amount thereof, confer on the holders thereof respectively the same privileges and advantages for the purposes of voting at meetings of the Company, and for other purposes, as would have been conferred by Shares of equal amount of the class converted in the Capital of the Company; but so that none of such privileges or advantages, except the participation of the dividends and profits of the Company, shall be conferred by any such aliquot part of consolidated Stock as would not, if existing in Shares, have conferred such privileges or advantages.

#### CAPITAL.

38. The original capital not required to be allotted under the Agreements mentioned in the Memorandum of Association, shall be allotted and issued by the Board to such persons and on such terms as the Directors may in the interest of the Company think fit, and either as fully or partly paid up Shares, and either with or without preference or priority as regards dividends, distribution of assets or otherwise over other Shares, and either at a premium or discount, and either with or without a guaranteed rate of interest, and subject to such conditions as to the amount of dividends or interest to be paid thereon, and as to payment by way of deposit or call, and as to the amount of calls and the time of payment thereof, or otherwise as they think fit to prescribe. Provided always that no Shares shall be allotted with any preference or priority as regards dividends or otherwise, or at a discount or subject to any special conditions as to the amount of dividend or interest to be paid thereon, without the consent of a Meeting of the Company having been previously obtained to such allotment.



29. The Board, with the sanction of a General Meeting of the Company, may from time to time increase the Capital of the Company the creation of new Shares. Such Shares shall be of such amount and shall be issued on such terms and conditions as the Company in General Meeting may direct, and subject to or in default of any such direction, the new capital shall be considered in all respects as part of the original capital of the Company, and all the powers and provisions hereinbefore given or contained in the case of original capital, including the power to attach thereto any preference or priority may be exercised in respect of and shall apply to any such new Shares.

30. The Company shall have power to reduce its subscribed capital whether paid up or uncalled, and to cancel any unallotted Shares, and also to consolidate or subdivide its Shares or any of them into Shares of a larger or smaller denomination, and the Company may return to its Members from time to time any amount paid upon their Shares in excess of that required to meet its liabilities.

#### GENERAL MEETINGS.

31. The first General Meeting shall be held at such time, not being more than four calendar months after the registration of the company, and at such place as the Board may determine, and shall be termed the Statutory Meeting.

32. Subsequent General Meetings shall be held at such time and place as may be prescribed by the company in General Meeting and if no other time or place is prescribed, a General Meeting shall be held once in every year, at such time and place as may be determined upon by the Board.

33. The last-mentioned General Meetings shall be called Ordinary General Meetings; all other General Meetings shall be called Extraordinary General Meetings.

34. The Board may, whenever they think fit, and they shall upon a requisition made in writing by members of the company, holding together at least one-tenth of the issued capital, upon which all calls for the time being have been paid, convene an Extraordinary General Meeting.

35. Any requisition made by the Members shall express the object of the Meeting proposed to be called, and shall be left at the Registered Office of the Company, or its principal place of business in London.

36. Upon the receipt of such requisition the Board shall forthwith proceed to convene an Extraordinary General Meeting. If they do not proceed to convene the same within twenty-one days from the date of the requisition, the requisitionists, or any other Members holding the prescribed number of Shares, upon which all calls for the time being have been paid, may themselves convene an Extraordinary General Meeting.

37. Seven clear days' notice at the least specifying the place, the day, and the hour of meeting, and in case of special business the general nature of such business, shall be given to the Members in manner hereinafter mentioned, or in such other manner, if any, as may be prescribed by the company in General Meeting; but the non-receipt of such notice by any member

shall not invalidate the proceedings at any General Meeting. The report of the Board shall be deemed notice of any special business mentioned or referred to therein.

#### PROCEEDINGS AT GENERAL MEETINGS.

38. The sanctioning a dividend recommended by the Board, the election of Directors and Auditors, and voting their remuneration, and the consideration of the accounts and balance sheet and report of the Board at an Ordinary Meeting, shall be deemed ordinary business; but all business other than that before-mentioned, transacted At an Ordinary Meeting, and all business of whatever kind transacted at an Extraordinary Meeting shall be deemed special.

39. No business shall be transacted at any General Meeting, except the nomination of a Chairman, the declaration of a dividend recommended by the Board, the re-election of Auditors and Directors, and the voting of their remuneration at the same rate as the year then last past, unless ten Members shall be present in person or by proxy, but, save as aforesaid, five Members personally present shall be a quorum for a General Meeting of the Company.

40. If within an hour from the time appointed for the Meeting a quorum, having regard to the business to be transacted, be not present, the Meeting, if convened upon the requisition of Members shall be dissolved; but in any other case it shall stand adjourned to the same in the next, at the same time and place; and if at such adjourned Meeting a quorum is not present it shall be adjourned sine die.

41. The Chairman (if any) of the Board shall preside as Chairman at every General Meeting of the Company.

42. If there be no such Chairman, or if at any Meeting he is not present within fifteen minutes after the time appointed for holding the Meeting, the Directors present shall choose one of their number to act, and if there be no Director willing to act, the Members present shall choose one of their number to be Chairman.

43. The Chairman may, with the consent of the Meeting, adjourn any Meeting from time to time and from place to place, but no business shall be transacted at any adjourned Meeting other than the business left unfinished at the Meeting from which the adjournment took place.

44. At any General Meeting, unless a poll is demanded in writing by at least five Members personally present and entitled to vote, a declaration by the Chairman that a resolution has been carried and an entry to that effect in the book of proceedings of the Company, shall be sufficient evidence of the fact of its having been carried, and (in case of an extraordinary or special resolution) by the required majority, without proof of the number or proportion of the votes recorded in favour of or against such resolution.

45. If a poll is demanded in writing by five or more Members personally present and entitled to vote, it shall be taken in such manner as the Chairman directs, and the result of such poll shall be deemed to be the resolution of the company in general Meeting.

46. Minutes shall be made in books provided for that purpose of all resolutions and proceedings of General Meetings, and any such minutes, if signed by any person purporting to be the chairman of the Meeting to which they relate, or by any person thereat and appointed by the Board to sign the same in his place shall be received as evidence of the facts therein stated without further proof.

#### VOTES OF MEMBERS.

47. Every Member shall have one vote for every Share. In the case of an equality of votes at any General Meeting or poll, the Chairman shall be entitled to a second or casting vote.

48. If any Member be a lunatic or idiot he may vote by his Committee, curator bonis, or other legal curator.

49. If one or more persons are jointly entitled to a Share or Shares, the Member whose name stands first in the Register of Members as one of the holders of such share or shares, and no other, shall be entitled to vote in respect of the same.

50. No Member shall be entitled to vote at any General Meeting unless all calls due from him have been paid, and no Member shall be entitled to vote at any Meeting held after the expiration of three calendar months from the first general allotment of shares, in respect of any Share that he has acquired by transfer unless he has been possessed of the Share in respect of which he claims to vote for at least three calendar months previously to the time of holding the Meeting at which he proposes to vote.

51. Votes may be given either personally or by proxy.

52. The instrument appointing a proxy shall be under the hand of the appointor, or if such appointor be a corporation, under their Common seal, in such form as the Board may from time to time approve. No person shall be appointed a proxy unless a Member of the company and entitled to vote, except that any corporation being a Member may appoint any member or officer of its own its proxy.

53. The instrument appointing a proxy shall be deposited at the registered office of the Company not less than forty-eight hours before the time for holding the Meeting at which the person named in such instrument proposes to vote, but no instrument appointing a proxy shall be valid after the expiration of three calendar months from the date of its execution, except upon a poll demanded at, or at an adjournment of, a Meeting held within three calendar months of its date.

#### DIRECTORS.

54. The first Director shall be appointed by a majority of the subscribers to the Memorandum of Association, and until such appointment the said Subscribers, or a majority of them, shall exercise all the powers exercisable by a Board of directors.

55. The number of Directors shall never be less than five, nor more than ten.

56. The qualification of a Director shall be the holding of 200 shares of the original capital of the Company or the equivalent in any new capital; provided that, except in the case of an appointment by the Subscribers to the Memorandum of Association or by the Directors under the power hereinafter given to appoint prior to the Ordinary General Meeting in 1888, or to fill a casual vacancy no person other than a retiring Director shall be appointed or elected a Director unless he shall have held his qualification for at least three calendar months next preceding the date of his election, and at least seven days' and not more than fourteen days' notice shall have been left at the registered office of the company of the intention to propose him; but nothing herein contained shall be taken to prevent the Board appointed by the Subscribers from acting prior to the first general allotment, although the Directors may not be qualified.

57. The remuneration of the Directors shall be the sum of £2,000 per annum; and, in addition thereto, a sum equal to 30 per cent of the net profits of each year remaining over after payment of a dividend thereout for the year of 10 per cent. upon the capital of the company, and such remuneration shall be divisible amongst the directors as they shall determine.

#### POWERS OF DIRECTORS.

58. The business of the Company shall be managed by the Board of directors, who may pay all expenses incurred in the formation and registration of the Company, and may exercise all such powers of the Company as are not by Statute or by these Articles required to be exercised by the Company in General Meeting, subject nevertheless to any regulations of these Articles; to the provisions of the Companies Acts and to such regulations, being not inconsistent with the aforesaid regulations or provisions, as may be subscribed by the Company in General Meeting; but no regulation made by the Company in General Meeting shall invalidate any prior Act of the Board which would have been valid if such regulation had not been made,

59. The Board may do the following things, but this Article shall not be deemed to restrict the foregoing general powers:-

- (A). They may pay for the acquisition of any property either in cash or in shares, or partly in cash and partly in Shares;
- (B) They may grant any licenses for use of the company's patents, or for the exercise of any of the company's patent rights, and may sell, let, or otherwise dispose of the whole or any part of the company's property, and with the consent of a General Meeting may accept as the consideration or part of the consideration, for any such license, or for the sale, letting, or other disposition as aforesaid any shares, debentures, or other obligations of any other company carrying on or formed to carry on any business comprised in the objects of the Company.
- (C) They may from time to time borrow any money upon the security of the whole or any part of the assets of the company including uncalled capital and in order to secure money borrowed or for any other purpose, may create, issue, make, draw, accept and endorse respectively mortgage debentures, bonds, or other obligations, or negotiable instruments; provided that every debenture or bond shall bear the seal of the Company, and every bill, promissory note, cheque or

other negotiable instrument drawn, made, or accepted shall be signed by one Director and countersigned by the Secretary or other officer of the Company appointed by the Board:

(D). They may invest or lend the funds of the company without security or in or upon such securities and in such manner and upon such terms as to interest and otherwise, as they deem fit, but so that no funds of the company shall be invested in the purchase of any of the shares or stock of the Company:

(E) They may from time to time appoint any one or more of their number Managing or Technical Director or Managing or Technical Directors on such terms as to remuneration in addition to his or their fees as Directors or otherwise, and for such period as they deem fit, and may delegate to him any of their powers other than their powers to borrow and make calls:

(f) They may, if any Director be required to render any extraordinary service, repay all expenses incurred by him in connection therewith, and grant him in addition such special remuneration for the services rendered as they think proper.

(G) They may appoint upon such terms and conditions as they think fit at any place where the Company carry on or desire to carry on business any persons who may be Members or Directors of the Company or not a local or advisory Board, and may delegate to any such Board any of their powers relating to the conduct of the Company's local business, and may regulate their proceedings and may discontinue and re-establish any such Board, and may dismiss any Member thereof and appoint a new Member or Members, and may fix the remuneration of the Members thereof which remuneration in the case of a Director of the Company may be in addition to his remuneration as such.

60. The continuing Directors may act notwithstanding any vacancy in their body.

61. The Board shall provide a seal for the use of the Company, and may exercise the powers of the "Companies seals Act 1864", which are hereby given to the Company. Any document to which seal of the Company shall be affixed, otherwise than under such Act, shall be signed by two Directors and countersigned by the Secretary, or other officer appointed by the Board.

## DISQUALIFICATION OF DIRECTORS.

62. The office of Director shall be vacated -

- (A) If he hold any other office or place of profit under the Company, other than herein authorized, or participate in the profits of any contract with the Company;
- (B) If he become bankrupt or of unsound mind or compound with his creditors;
- (C) If he cease to hold his qualification;
- (D) If he send in a written resignation to the Board and the same be accepted or be not withdrawn for seven days;
- (E) If he be absent from the Board Meetings continuously for six months without the consent of the Board.

But the above rules shall be subject to the following exceptions: That no Director shall vacate his office by reason of his being a Member of any Company or Partnership which has entered into contracts with the Company, or by reason of his being personally interested either in his individual capacity or as a Member of any such Company or Partnership in any contract with the Company, or any adventure or undertaking in which the Company may also have an interest, and he shall be competent for any such Director or any firm of which he is a partner to retain for his or their benefit any profit under any such contract: nevertheless no such Director shall vote in respect of such contract or work; and if he does so vote his vote shall not be counted.

## ROTATION OF DIRECTORS.

63. At the Ordinary Meeting next after the Statutory Meeting, and at the Ordinary Meeting in every subsequent year, one-third of the Directors for the time being, or if their number be not a multiple of three, then the number nearest to one-third shall retire from office.

64. The one-third, or the nearest number, to retire at the first and second Ordinary Meetings of the Company, at which Directors should retire, shall, unless the Directors agree among themselves, be determined by ballot. In every subsequent year the one-third, or other nearest number who have been longest in office, shall retire.

65. A retiring Director shall be re-eligible.

66. The Company at the General Meeting at which any Directors retire in manner aforesaid shall, subject to any resolution reducing the number of Directors, fill up the vacated offices by electing a like number of persons.

67. If at any Meeting at which an election of Directors ought to take place the places of the vacating Directors are not filled up, the vacating Directors, or such as have not had their places filled up, shall continue in office until the Ordinary Meeting in the next year, and so on from time to time until their places are filled up.

68. The Company may from time to time, in General Meeting, and within the limits fixed by these Articles, increase or reduce the number of Directors, and upon passing any resolution to increase, may appoint the additional Directors necessary to carry the same into effect, and may also determine in what rotation such increased or reduced number is to go out of office.

69. Any casual vacancy occurring in the Board may be filled up by the Board, who may likewise appoint any properly qualified person a Director at any time prior to the Ordinary General Meeting in 1883, but so that there be not more than ten Directors in all. Any person appointed by the Board prior to the said Ordinary General Meeting may be so appointed upon the terms that he is not to have any vote, and any person chosen by the Board to fill a casual vacancy, shall retain his office so long only as the vacating Director would have retained the same if no vacancy had occurred.

70. The Company in General Meeting, may, by a special resolution, remove any Director before the expiration of his period of office, and may by an ordinary resolution appoint another person in his stead. The person so appointed shall hold office during such time only as the Director in whose place he is appointed would have held the same if he had not been removed.

#### PROCEEDINGS OF DIRECTORS.

71. The Board may meet together for the dispatch of business, may adjourn and otherwise regulate their Meetings as they think fit, and may determine the quorum necessary for the transaction of business. Questions arising at any Meeting shall be decided by a majority of votes. In case of equality of votes the Chairman shall have a second or casting vote. A Director may at any time summon a Meeting of the Board.

72. The Board shall elect a Chairman of the Company, and determine the period for which he is to hold office. If at any Meeting the Chairman be not present at the time appointed for holding the same, the Directors present shall choose some one of their number to be Chairman of such Meeting.

73. The Board may delegate any of their powers to Committees consisting of such Member or Members of their body as they think fit. Any Committee so formed shall, except as herein otherwise provided in the exercise of

the powers so delegated, conform to any regulations that may be imposed on them by the Board.

74. A Committee may elect a Chairman of their Meetings. If no such Chairman is elected, or if he is not present at the time appointed for holding the same, the Members present shall choose one of their number to be Chairman of such Meeting.

75. A Committee may meet and adjourn as they think proper; questions arising at any Meeting shall be determined by a majority of votes of the Members present; and in case of an equality of votes the Chairman shall have a second or casting vote.

76. All Acts of the Board, or of a Committee of Directors, or of any person acting as a Director, shall, notwithstanding that it be afterwards discovered that there was some defect in the appointment of any Directors or persons acting as aforesaid, or that they or any of them were disqualified, be as valid as if every such person had been duly appointed and was qualified to be a Director.

#### DIVIDENDS.

77. The Board may, with the sanction of the Company in general Meeting, declare a dividend to be paid to the Members. Until such dividend shall amount in any year to 5 per cent. on the paid-up capital the same shall be paid in proportion to the amount paid up on the Shares, and thereafter in proportion to the number of Shares held by each member irrespective of the amount paid-up thereon respectively.

78. The Board may, at their own discretion, when the profits of the Company appear to them to justify such a course, declare any pay, in manner aforesaid at the end of any half of the Company's financial year an ad interim dividend not exceeding the rate of the last year's dividend.

79. The Board may, before recommending any dividend, set aside out of the profits of the Company, such sum as they think proper as a Reserve Fund to meet contingencies, or for equalising dividends, or for repairing or maintaining any property of the Company, or any part thereof; and subject to the regulations may, from time to time, apply the whole or any part of such reserve Fund for any purposes of the Company.

80. The Board may deduct from the dividends or interest payable to any Member all such sums of money as may be due from him to the Company on account of Calls or otherwise.



81. Every dividend and instalment of interest shall belong and be paid (subject to the Company's lien) to those Members who shall be on the Register at the date of the meeting at which such dividend shall be declared, or interest shall be payable, notwithstanding any subsequent transfer or transmission of Shares.

82. Notice of any dividend that may have been declared shall be given to each Member in manner hereinafter provided as to notices generally.

83. No dividend shall bear interest as against the Company.

#### ACCOUNTS.

84. The Board shall cause accounts to be kept of the assets and liabilities, receipts, and expenditure of the Company. The Books of Account shall be kept at the registered Office of the Company.

85. Once at least in every year the Board shall lay before the Company in General Meeting a statement of the income and expenditure for the past year, and a balance sheet showing the assets and liabilities of the Company made up to a date not more than four months before such meeting, accompanied by a Report of the Board on the position and transactions of the Company.

86. Any monies paid by the Company for the purchase of any other business, together with the cost of forming and establishing the Company and such of the cost of carrying on the business of the Company for any period not exceeding two years from registration, the Company deem fit, may be treated as capital expenditure, and may be spread over a series of years, and the amount of such expenditure for the time being outstanding may, for the purposes of calculating the profits of the Company, for the purpose of dividends, be reckoned as an asset.

#### AUDIT.

87. Once at the least in every year, that is to say preparatory to the Ordinary General Meeting in each year, after the meeting directed to be called within four months of the registration of the Company, the accounts of the Company shall be examined, and the correctness of the balance sheet ascertained by one or more Auditor or Auditors.

88. The first Auditors shall be appointed by the Board; subsequent Auditors shall be appointed by the Company in General Meeting.

89. If one Auditor only is appointed all the provisions herein contained relative to Auditors shall apply to him.

90. The Auditors may be Members of the Company; but no Director or other officer of the Company shall be eligible during his continuance in office.

91. The election of Auditors shall be made by the Company at their Ordinary Meeting in each year.

92. The remuneration of the first Auditors shall be fixed by the Board; that of subsequent Auditors shall be fixed by the Company in General Meeting.

93. Any Auditor shall be re-eligible on his quitting office.

94. If there be more than one Auditor appointed, and a casual vacancy occur in the office of Auditor, it may be filled up by the Board, but so that only one such appointment be made between any two ordinary General Meetings; but save as aforesaid, if any casual vacancy occurs, the Board shall forthwith call an extraordinary General Meeting for the purpose of supplying the same.

95. If no election of Auditors is made in manner aforesaid, the Board of Trade may, on the application of not less than five Members of the Company, appoint an Auditor for the current year, and fix the remuneration to be paid to him by the Company for his services.

96. Every Auditor shall be supplied with a copy of the balance sheet and statement of receipts and expenditure, and it shall be his duty to examine the same, with the accounts and vouchers relating thereto.

97. Every Auditor shall have, at his request, a list delivered to him of all books kept by the Company, and shall at all reasonable times have access to the books and accounts of the Company.

98. The Auditors shall certify to the Members the correctness of the balance sheet and accounts, and may give such report to the Members upon the state of the Company's affairs as they think proper.

#### NOTICES.

99. A Notice may be served by the Company upon any Member either personally or by sending it through the post in an envelope addressed to such Member at his registered address within the United Kingdom, or as to Members not having such an address registered, by leaving the same at the Registered Office of the Company or at its principal place of business in London.

100. All Notices directed to be given to the Members shall, with respect to any Share to which persons are jointly entitled, be given to whichever of such persons is named first in the Register of Members; and notice so given shall be sufficient notice to all the holders of such Share.

101. Any notice, if served by post, shall be deemed to have been served at the time when, in the ordinary course of post, the same would be delivered; and in proving such service, it shall be sufficient to prove the address on the envelope enclosing the notice and the posting of it.

NAMES AND ADDRESSES OF SUBSCRIBERS.

Charles Marrison, 55, Coleman St. London.  
No occupation.

W. C. Quilter, 14 Rings Arms Yard, London.  
Stockbroker.

H. H. Dobson, 6 Tokenhouse Yard, London.  
Merchant.

G. W. Batt, 20 Ct. Winchester St. London.  
Merchant.

T. Ellis, 20 St. Winchester St. London.  
Merchant.

Charles Waring, 10, Victoria Chambers, Westminster.  
Contractor for Public Works.

Cornelius Cox, 14 Kings Arms Yard, London.  
Stockbroker.

Dated this 16th day May, 1882.

Witness to the above signatures -

Frank Crisp  
Solicitor,  
20 Old Jewry, London

STAMPS

REGISTERED

6d.

8544

5/-

26 JUN 1882



HEADS OF AGREEMENT made this sixteenth day of May One thousand eight hundred and eighty two BETWEEN JOHN CAMERON SWAN of the Borough and County of Newcastle-upon-Tyne Merchant on behalf of the Swan Electric Light Company Limited hereinafter called the Swan Company of the one part and THOMAS ABERCROMBIE WELTON of No-5 Moorgate Street London Public Accountant, herein after called the purchaser of the other part.

1. THE Swan Company agrees to sell and the purchaser to buy the patents processes business goodwill and all other assets and rights of the Swan Company of every kind.

2. THE purchaser agrees within fourteen days from the date hereof to form a limited company under the Companies Acts and to transfer to such Company the said patents processes business goodwill and other assets and rights of the Swan Company and to obtain the adoption of this Agreement by such Company hereinafter called the New Company.

3. THE new Company shall have a capital of One Million pounds sterling divided into Two hundred thousand shares of Five pounds each and the first issue of such shares shall be One hundred thousand including the paid up shares hereinafter mentioned So many of the said first issue of shares as are not fully paid up shall be issued upon the terms of Two pounds per share being called up on each share within twelve months from the date hereof.

4. THE purchaser shall as part of the consideration for the said sale to him procure the allotment of Eight thousand seven hundred and fifty shares in the Company (upon each of which the full sum of £5 per share shall be credited as having been actually paid) to the Swan Company or to their nominees and in such manner as they may request and shall cause to be done all acts necessary to constitute such paid up shares valid and legally paid up and free from any liability to the holders thereof.

5. IN addition to the allotment of the said shares and as further consideration for the said sale the New Company shall pay to the Swan Company the sum of Fifty thousand pounds in cash within one month from the date hereof and the further sum of Twelve thousand pounds by four equal instalments on the seventh February in each of the years One thousand eight hundred and eighty three One thousand eight hundred and eighty four One thousand eight hundred and eighty five and One thousand eight hundred and eighty six.

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6. THE paid up shares mentioned in the fourth clause hereof shall participate in dividends with the other shares in the Company in proportion to the amounts from time to time respectively paid or treated as paid up thereon until such dividends shall in each year amount to Five pounds per cent per annum upon the capital actually paid up and thereafter all the issued shares shall in each year rank alike for dividends per share without reference to the amount paid or treated as paid up thereon.

7. THE New Company shall pay and discharge all debts and liabilities of The Swan Company whether liquidated or unliquidated and shall carry out and perform all contracts and agreements entered into by that Company whether with persons employed by the Company or otherwise howsoever.

8. THE New Company shall purchase the Foreign and Colonial Patents connected with or relating to Electric Lighting belonging to Mr Joseph Wilson Swan or controlled by him (other than those for the storage of Electricity except as to his interests therein)

9. The purchaser shall use his best endeavour to secure the services or co-operation of Mr. R Evelyn Crompton and the use of his Patents upon terms to be approved of by The Swan Company.

10. The purchaser shall endeavour to secure the services of Mr Joseph Wilson Swan as Technical Director of the New Company for seven years at a remuneration of One thousand pounds a year he giving to the business of the New Company a sufficient amount of his time and attention but not being bound to devote himself exclusively thereto.

11. THE purchaser may fix the shares of the New Company at a larger or smaller amount than Five pounds each in which case the provisions of this Agreement shall be varied accordingly but so that the amount of Capital intended to be represented by the Shares hereinbefore provided for shall still be represented by such modified shares.

12. The Swan Company may terminate this Agreement if the New Company shall not be incorporated and Two hundred and fifty thousand pounds of the capital actually subscribed within fourteen days from the date hereof.

13. The costs of the Swan Company in connection with this sale shall be paid by the purchaser.

14. THE Swan Company shall enter into a covenant with the purchaser not to exercise the option given to them under the Agreement with Mr Sellon of giving up the right to use certain patents therein mentioned and shall execute and procure to be executed all assignments and other deeds which may be reasonably

required by the Purchaser or the New Company to carry out these heads but the purchaser and the New Company shall not require any covenants as to the said Patents except that the Swan Company have not incumbered. The terms contained in these Heads shall be embodied in a formal agreement which shall contain all usual and proper clauses for the more fully carrying out the true intent and meaning of the Parties hereto. In case of any difference of opinion as to the said Agreement or as to the proper construction hereof or upon any matter connected herewith or arising hereout such difference shall be referred to and settled by Mr I.F.Moulton on behalf of all parties.

15. UPON the adoption of this Agreement or of the more formal Agreement mentioned in clause 14 hereof by the Company that the purchaser shall be discharged from all liability in respect thereof.

For the Swan Electric Light Company Limited,

(Sgd) J. CAMERON SWAN,

THOMAS A. WELTON.

WITNESS

(Sgd) Robert Spence Watson,  
Solicitor  
Newcastle-upon-Tyne.

WITNESS

(Sgd) Wm. Walker  
Clerk to Quilter Ball & Co.  
5 Moorgate Street.



AN AGREEMENT made the 1st day of October 1883 BETWEEN THE EDISON ELECTRIC LIGHT COMPANY LIMITED (hereinafter called "The Edison Company") of the first part THE SWAN UNITED ELECTRIC LIGHT COMPANY LIMITED (hereinafter called "The Swan Company") of the second part and GEORGE BLACK of 21 Burghley Road Kentish Town in the County of Middlesex Gentleman as Agent for and on behalf of a Company intended to be registered under the name of THE EDISON AND SWAN UNITED ELECTRIC LIGHT COMPANY LIMITED (hereinafter called the "United Company") of the third part. WHEREAS it is intended that the Edison Company and the Swan Company respectively shall for the considerations hereinafter appearing sell its business goodwill and other property (with the exception set forth in the second Clause hereof) to the United Company subject to the provisions and otherwise in the manner and upon the terms hereinafter expressed. AND WHEREAS a print of the proposed Memorandum and Articles of Association of the United Company has been approved by the parties hereto of the first and second parts.

NOW it is hereby agreed as follows:-

1. The Edison Company shall sell to the United Company and the United Company shall purchase from the Edison Company all the business goodwill patent rights privileges and other property whatsoever of the Edison Company.
2. The Swan Company shall sell to the United Company and the United Company shall purchase from the Swan Company all the business goodwill patent rights privileges and other property whatsoever of the Swan Company except only the Foreign and Colonial Patents and the rights and privileges connected therewith and the business and goodwill of the Swan Company without the United Kingdom.
3. The sale by each of the selling Companies shall take effect as from the 30th June last as from which date each selling Company shall as between itself and the United Company be deemed to have carried on and to be carrying on the business hereby agreed to be sold for and on account of the United Company. The United Company shall as between itself and the selling Companies respectively take over and discharge all the debts and liabilities of the said selling Companies respectively as on 30th June last (except such portion of the debts and liabilities of the Swan Company as are in respect of the property not sold by them as aforesaid) but so that nothing in this Clause shall be deemed to extend the rights of any third parties or to create any direct liability between them or any of them and the United Company.
4. As the consideration for such sale by the Edison Company the United Company shall allot to the Edison Company or as it may direct 45,000 ordinary or A Shares of 25 each part of the original Capital of the United Company 40,000 of such Shares shall be issued as Shares upon which the sum of £2-10s. has been paid up and the remaining 5,000 Shares shall be issued as fully paid Shares. The Edison Company shall have the option (to be exercised in writing within three months from the date hereof) of requiring that in lieu of any of the said

5,000 Shares the United Company shall allot to it or as it may direct twice the number of ordinary or A Shares to be issued as Shares upon which £2 10s per Share has been paid up. The United Company shall also from time to time issue (as further part of such consideration) to the Edison Company or as it may at any time hereafter direct fully paid-up B Shares of £5 each in the following proportions one fully paid up B Share for every £15 paid up or credited as paid up on the A Shares of the United Company whether such A Shares form part of the original capital of the United Company or of any increase of capital. The said B Shares shall not be entitled to receive any dividend until there has been paid as dividend on the ordinary or A Shares of the United Company a sum equal in the aggregate to a preferential cumulative dividend of 7 per cent. per annum on the amount paid up or credited as paid up on such A Shares but after such dividend has been paid the surplus profits available for dividend shall be divided between the A Shares and the B Shares in proportion to the amount paid up or credited as paid up thereon subject to the provisions of Clause 5 in respect of the A Shares to be allotted to the Swan Company as fully paid-up Shares. The voting power of the B Shares shall be one vote for every two Shares each A Share being entitled to one vote. In the case of a winding-up the holders of A Shares shall be entitled to receive in full the amount paid up or credited as paid up upon their Shares with any arrears of the 7 per cent. dividend in priority to any payment to the holders of B Shares and any surplus of assets then remaining shall be distributed in the proportion of one-fourth among the holders of B Shares and three-fourths among the holders of A Shares but this provision shall not prejudice the rights of the holders of A Shares inter se in respect of A Shares issued under special conditions.

5. As the consideration for such sale by the Swan Company the United Company shall allot to the Swan Company or as it may direct 81,400 ordinary or A Shares of £5 each part of the original Capital of the United Company 49,251 of such Shares shall be issued as Shares upon which the sum of £2 10s. has been paid up and the remaining 12,139 Shares shall be issued as fully paid Shares. Such last-mentioned fully paid Shares shall participate in dividends with the other ordinary or A Shares in proportion to the amounts from time to time respectively paid up or credited as paid up thereon until such dividends shall in each year amount to £5 per centum per annum upon the capital paid up or credited as paid up and thereafter such last-mentioned fully paid Shares shall in each year rank for dividends without reference to the amount credited as paid up thereon and each such Share shall receive the same amount of dividend as each other Ordinary or A Share to be allotted to the Swan Company irrespective of the amount for the time being paid up thereon. The Swan Company shall have the option (to be exercised in writing within three months from the date hereof) of requiring that in lieu of any of the said 12,139 Shares the United Company shall allot to it or as it may direct twice the number of ordinary or A Shares to be issued as Shares upon which £2 10s. per Share has been paid up.



6. The United Company shall have full power hereafter to issue any of the ordinary or A Shares part of the original capital of the Company or any A Shares of increased capital as preferential guaranteed or deferred Shares provided that in no case shall the rights of the B Shareholders to participate in the profits of the United Company in manner hereinbefore provided by Clause 4 be thereby interfered with or their interest in the profits of the United Company diminished.

7. All necessary Contracts shall be executed by the United Company and registered prior to the issue of the said Shares referred to in Clauses 4 and 5.

8. The purchase shall be completed on the 31st day of October instant whereupon the said Shares shall be allotted to the Edison Company and the Swan Company respectively or as they may respectively direct and each of the said Companies shall thereupon deliver such of the property hereby by it agreed to be sold as may be capable of delivery and shall execute and cause to be executed by all necessary parties all proper assignments and conveyances of the residue of the property hereby by it agreed to be sold including the said Letters Patent.

9. The Patents hereby agreed to be sold to the United Company shall be assigned to Thomas Alva Edison The Swan Electric Light Company Limited and R. E. Crompton & Co. or such one or more of them or to such other person or persons as the United Company may desire in trust for the United Company and such assignments shall be duly registered. A proper Deed of Trust containing the necessary powers for using the names of the Trustees in case of litigation relating to the Patents shall be drawn up and executed prior to such registration.

10. The United Company shall indemnify and keep harmless the Edison Company from all claims against it of whatever nature arising previously to the 30th June last (other than claims under the Agreement of the 18th day of February 1882 schedules to the Articles of Association of the Edison Company except those under Clause 15 of the said Agreement) and shall bear and pay all costs and charges of and incidental to the carrying out of this Agreement and the winding up of the Edison Company.

11. The United Company shall indemnify and keep harmless the Swan Company from all claims against it of whatever nature arising previously to the 30th June last (other than claims arising out of or connected with the property not sold by them as aforesaid) and shall bear and pay all costs and charges of and incidental to the carrying out of this Agreement and the winding up of the Swan Company in case it shall determine to be wound up upon the execution of this Agreement or within six months thereafter but such costs shall not be increased by arrangements relating to the property not sold by them as aforesaid.

12. The Edison Company and the Swan Company shall each if the necessary Resolutions for confirming this Agreement are passed at the Meetings of the respective Companies which have been called for the 2nd day of October instant forthwith take all such steps as may be necessary to carry out this Agreement in accordance with its true intent.

13. If the Shareholders of the Edison Company or of the Swan Company refuse or neglect on or before the 31st day of October instant to confirm this Agreement or to pass any resolution necessary for giving effect to the same then in either of such cases either of the Companies parties hereto may rescind this Agreement by notice in writing to the other.

14. Neither the Edison Company nor the Swan Company shall be deemed to warrant the validity of any Letters Patent hereby agreed to be sold nor be liable for the non-performance by the other of anything hereby agreed to be done but each of the said Companies shall be deemed to guarantee that it has not granted any Licenses to make use or vend the inventions the subject of the said Patents or any of them save in respect to plant lamps or other articles made and already sold by them except those scheduled hereto.

15. Each selling Company shall use its best endeavours to procure the assignment to the United Company of all property hereby agreed to be sold and shall meanwhile hold the same in trust for the United Company.

16. The said George Black shall incur no responsibility whatever under this Agreement but so soon as the same is adopted and confirmed by the United Company the same shall be binding on such Company in the same way as if entered into under its Common Seal.

17. If any doubt difference or dispute shall arise between the parties hereto or any of them as to the construction of this Agreement or as to anything to be done or money to be paid hereunder or otherwise as to anything herein contained the matter in difference shall be referred to some person agreed on between the parties or in case of difference to be nominated by the President of the Incorporated Law Society for the time being whose decision shall be final with power to him to nominate any other person in the event of the death or refusal to act of the person first nominated

=====

THE SCHEDULE ABOVE REFERRED TO.

-----

Licenses Granted by the Edison Company.

1882 August 10th and 1883 February 27th License to the Manchester and District Edison Electric Light Company Limited.

1882 August 11th License to the British Electric Light  
Company Limited.

1883 August 3rd Agreement respecting Lamps with the  
Telegraph Construction and Maintenance Company.

In witness whereof the Edison Company and the Swan  
Company have hereunto respectively set their Common Seal  
the day and year first above written.

(Sgd) Milford Bidwell }  
J. W. Wall } Directors

S E A L

H. S. Trehearne Acting Secy.

J. S. Trevor }  
G. W. Batt } Directors

S E A L

James H. Ivory Secretary

18984/20

-Exhibit H-

REGISTERED

9590

18 MAR 1895

STAMPS

10/-

5/-



TO ALL TO WHOM these Presents shall come  
 The Edison and Swan United Electric Light Company  
 Limited (hereinafter referred to as the United Company,  
 whose registered Office is at 36 and 37 Queen Street  
 in the City of London Sends Greeting WHEREAS by an  
 Agreement dated the first day of October One thousand  
 eight hundred and eighty three and made between the  
 Edison Electric Light Company Limited (hereinafter  
 referred to as the Edison Company) of the first part  
 the Swan United Electric Light Company Limited  
 (hereinafter referred to as the Swan Company) of the  
 second part and George Black as Agent for and on  
 behalf of the United Company which was then not yet  
 registered of the third part. It was agreed that the  
 United Company should purchase all the business and  
 property of the Edison Company and all the business and  
 property of the Swan Company except its foreign Patents  
 and business and that as the consideration for such  
 purchase the United Company should allot to the  
 Edison Company or as it might direct Forty five  
 thousand A Shares of Five pounds each of the United  
 Company of which Forty thousand should be issued as  
 Shares upon which Two pounds ten shillings had been  
 paid the remaining Five thousand should be issued as  
 fully paid and should also issue to the Edison Company  
 or as it might direct fully paid B Shares of Five  
 pounds each in the United Company in the proportion  
 of one fully paid B share for every Fifteen pounds paid  
 or credited as paid on the A Shares of the United  
 Company and should also allot to the Swan Company or as  
 it might direct One thousand four hundred A Shares of  
 Five pounds each of the United Company of which Forty  
 nine thousand two hundred and sixty one should be  
 issued as Shares on which the sum of Two pounds ten  
 shillings had been paid and the remaining Twelve  
 thousand one hundred and thirty nine should be issued  
 as fully paid Shares And under the said Agreement the  
 Edison Company and the Swan Company had respectively  
 the option of requiring the allotment in lieu of the  
 said fully paid A Shares to which they were respectively  
 entitled of twice the number of A Shares having two  
 pounds ten shillings only paid thereon AND WHEREAS the  
 said Agreement was duly adopted by the United Company  
 after its incorporation AND WHEREAS it is desired to  
 specify the number of shares which have in fact been  
 allotted pursuant to the said Agreement with the  
 distinctive Nos. thereof.

NOW these Presents WITNESS and the United  
 Company hereby declares as follows;

1.

THE number of A Shares of the United Company  
 allotted and issued pursuant to the said Agreement  
 as shares upon which the sum of Two pounds ten shillings  
 had been paid was Eighty nine thousand two hundred and  
 sixty one which shares are distinguished in the books  
 of the United Company by the Nos. 1 to 89261 inclusive.

2. THE number of A Shares of the United Company allotted and issued pursuant to the said Agreement as fully paid up was Seventeen thousand one hundred and thirty nine which shares are distinguished in the books of the United Company by the Nos. 01 to 017139 inclusive.
3. THE number of B Shares of the United Company allotted and issued pursuant to the said Agreement as fully paid up is Twenty three thousand five hundred and sixty four which shares are distinguished in the books of the United Company by the Nos. B1 to B 23564 inclusive.

IN WITNESS whereof the United Company has hereunto caused its Common Seal to be affixed the nineteenth day of February One thousand eight hundred and ninety five.

THE COMMON SEAL of the  
Edison and Swan United  
Electric Light Company  
Limited was affixed  
hereto in the presence  
of:-

(Sgd) N. FORBES }  
{ S.FLOOD PAGE } Directors  
H.CHARLES GERN Secretary

S E A L



No. 18984/38  
Registered  
61608  
19 Aug. 1904.

In the High Court of Justice  
Chancery Division  
Mr. Justice Buckley

00180 of 1904

Tuesday the 26th day of July 1904

In the Matter of THE EDISON AND SWAN UNITED ELECTRIC  
LIGHT COMPANY LIMITED AND REDUCED

AND

In the Matter of The Companies Act 1867

AND

In the Matter of The Companies Act 1877.

Upon the Petition of the above named Edison and Swan United Electric Light Company Limited and Reduced on the 5th July 1904 preferred unto this Court and upon hearing Counsel for the Petitioner and for Henry Wolfenden a Debenture Holder of the above named Company supporting the said Petition and upon reading the said Petition the Order dated the 13th July 1904 (dispensing with the list of Creditors) the Affidavit of Henry Wolfenden filed the 8th July 1904 and the Affidavit of Henry Charles Gover filed the 13th July 1904 and the several exhibits in the said Affidavits respectively referred to the London Gazette and the Times and the Electrical Review Newspapers all dated the 15th July 1904 and all containing a notice of the presentation of the said Petition and that the same was appointed to be heard on the 26th July 1904 And the said Henry Wolfenden by his Counsel consenting to this Order

THIS COURT DOETH ORDER that the cancellation and reduction of the Capital of the above named Company resolved on and effected by the special resolution passed at an Extraordinary General Meeting of the Petitioner the said Edison and Swan United Electric Light Company Limited and Reduced held on the 12th May 1904 and confirmed at an Extraordinary General

Meeting of the said Petitioner held on the 30th May 1904 and which resolution was in the words and figures following that is to say:-

"That the capital of the Company be reduced from £1,000,000 divided into 150,000 A shares of £5 each and 50,000 B shares of £5 each to £941,090 divided into 150,000 A shares of £5 each 26436 "B" Shares of £5 each and 23564 B shares of £2. 10. 0. each and that such reduction be effected by cancelling paid up capital which has been lost or is unrepresented by available assets to the extent of £2. 10. 0. per share on each of the 23564 B shares which have been issued and are now outstanding and by reducing the nominal amount of each of such 23564 B shares to £2. 10. 0."

be and the same is hereby confirmed in conformity with the provisions of the above mentioned Acts.

AND IT IS ORDERED that this Order be produced the Registrar of Joint Stock Companies and that an Office Copy thereof be delivered to him together with a Minute in the words or to the effect set forth in the Schedule hereto

AND IT IS ORDERED that Notice of the Registration by the Registrar of Joint Stock Companies of this Order and of the said Minute be published as follows that is to say once each in the "London Gazette" and in the Times and the Electrical Review Newspapers within 10 days after such registration.

AND IT IS ORDERED that the addition of the words "and reduced" to the title of the said Company be continued for 3 months from the date of this Order

H.J.Hood  
Registrar Companies (Winding up)

#### THE SCHEDULE

MINUTE APPROVED BY THE COURT.

The Capital of the Edison and Swan United Electric Light Company Limited and Reduced henceforth is £941090 divided into

150,000 A Shares of £5 each 26436 B Shares of £5 each and 23564 B shares of £2. 10. 0. each and instead of the original capital of £1,000,000 divided into 150,000 A shares of £5 each and 50,000 B shares of £5 each.

At the time of the registration of this Minute 116400 of the said A shares and 23564 of the said B shares have been issued and the following amounts are to be deemed to have been paid up on the same respectively Upon each of the 99261 A shares numbered in the Register of the Company from 1 to 99261 inclusive the sum of £3 upon each of the 17139 A shares numbered 01 to 017139 in the said Register the whole amount thereof upon each of the said 23564 B shares numbered in the said Register from B1 to B 23564 inclusive the sum of £2. 10. 0.

The remainder of the capital is unissued

H.J.Hood

Registrar Companies (Winding up).



18984/43  
Registered  
28799  
17 Mar. 1906



In the High Court of Justice  
Chancery Division  
Mr. Justice Warrington

No. 128 B 31  
00281 of 1905.

Tuesday the 6th day of March 1906.

In the Matter of The Edison & Swan United Electric Light  
Company limited and Reduced

And

In the Matter of the Companies Act 1867

And

In the Matter of the Companies Act 1877

Upon the Petition of the above named Edison & Swan United  
Electric Light Company Limited and Reduced on the 1st December 1905  
Preferred unto this Court AND UPON hearing Counsel for the Petitioner  
and for Henry Wolfenden a Debenture Holder of the above named Company  
And upon reading the said Petition the Order dated the 21st February  
1906 (dispensing with the list of Creditors) and the Affidavit of  
Henry Wolfenden filed the 20th February 1906 and the Exhibits in  
the said Affidavit referred to The London Gazette and the Times  
and the Electrical Review Newspapers all dated the 23rd February  
1906 and all containing a Notice of the presentation of the said  
Petition and that the same was appointed to be heard on the 6th  
March 1906

THIS COURT DOETH ORDER that the cancellation and reduction of the  
Capital of the above named Company resolved on and effected by the  
Special Resolution passed at an Extraordinary General Meeting of the  
Petitioner The said Edison & Swan United Electric Light Company  
Limited and Reduced held on the 12th October 1905 and confirmed at  
an Extraordinary General Meeting of the said Company held on the 30th  
October 1905 and which Resolution was in the words and figures  
following that is to say:-

"That the Capital of the Company be reduced from £941090 divided into 150000 "A" Shares of £5 each 26436 "B" Shares of £5 each and 23564 "B" shares of £2.10.0. each to £888071 divided into 150,000 "A" Shares of £5 each 26436 "B" shares of £5 each and 23564 "B" Shares of 5/- each and that such reduction be effected by cancelling paid up Capital which has been lost or is unrepresented by available assets to the extent of £2. 5. 0. per share on each of the 23564 "B" Shares which have been issued and are now outstanding and by reducing the nominal amount of each of such 23564 "B" shares to 5/- be and the same is hereby confirmed in accordance with the provisions of the above mentioned Acts.

AND THE COURT DOTH HEREBY APPROVE the form of Minute set forth in the Schedule hereto

AND IT IS ORDERED that this Order be produced to the Registrar of Joint Stock Companies and that an Office Copy thereof be delivered to him together with a Minute in the words or to the effect set forth in the Schedule hereto

AND IT IS ORDERED that Notice of the Registration by the Registrar of Joint Stock Companies of this Order and of the said Minute be published as follows that is to say;- Once each in The London Gazette and in the Times and the Electrical Review Newspapers within 10 days after such registration

AND IT IS ORDERED that the addition of the words "and Reduced" to the title of the said Company be continued for one month from the date of this Order.

H. J. HOOD

Registrar Companies (Winding up).

THE SCHEDULE BEFORE REFERRED TO  
MINUTE APPROVED BY THE COURT.

"The Capital of the Edison & Swan United Electric Light Company Limited and Reduced henceforth is £888071 divided into 150,000 "A" shares of £5 each 26436 "B" shares of £5 each and 23564 "B"

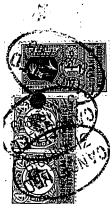
Shares of 5/- each instead of the former Capital of £941090 divided into 150,000 "A" shares of £5 each 26436 "B" shares of £5 each and 23564 "B" shares of £2. 10s. each.

At the time of the Registration of this Minute 116400 of the said "A" shares (numbered as hereinafter mentioned) and 23564 of the said "B" shares (numbered as hereinafter mentioned) have been issued and the following amounts are to be deemed to have been paid up on the same respectively. Upon each of the 99261 "A" shares numbered in the Register of the Company from 1 to 99261 inclusive the sum of £3 upon each of the 17139 "A" shares numbered 01 to 017139 in the said Register the whole amount thereof upon each of the said 23564 "B" shares numbered in the said Register from B1 to B 23564 inclusive the sum of 5/-.

The remainder of the Capital is unissued".

H.H.

(11)



No. of Certificate 18984Ca/74  
Registered  
31760  
12 Mar. 1919

THE EDISON SWAN ELECTRIC COMPANY LIMITED

The Companies Acts 1908 and 1913

Company limited by Shares

EXTRAORDINARY RESOLUTION

(Pursuant to Section 69 of the Companies (Consolidation) Act 1908  
of

THE EDISON SWAN ELECTRIC COMPANY LIMITED

Passed 17th February 1919.

At an Extraordinary General Meeting of the "A" Shareholders of The Edison Swan Electric Company Limited duly convened and held at Winchester House Old Broad Street in the City of London on Monday the 17th day of February 1919 the following Resolution was duly passed as an Extraordinary Resolution:-

RESOLUTION.

"That for the purpose of raising additional Working Capital the Company shall be at liberty to convert all the existing "A" Shares issued and unissued into Ordinary Shares of £1 each and to consolidate the 23564 "B" Shares 5/- paid into 5891 Shares of £1 each and to convert them when so consolidated into Ordinary Shares of £1 each fully paid. And further to convert the unissued 26436 "B" Shares of £5 each into 132180 Ordinary Shares of £1 each. All such Ordinary Shares to rank pari passu without any preference or right to cumulative dividends".

"That for completing such conversion of the "B" Shares into Ordinary Shares the existing "B" Share Certificates be called in by the Directors and cancelled and new Certificates issued therefor".  
Dated this 11th day of March 1919

R. H. PARKER Secretary.

123/125 Queen Victoria Street London E.C.4.

I certify that the above is a true full and complete copy of the resolutions referred to

R. H. PARKER Secretary

Dated this 11th day of March 1919.

(1)



No. of Certificate 18984C/73  
Registered  
31761  
12 Mar. 1919.

THE EDISON SWAN ELECTRIC COMPANY LIMITED

The Companies Acts 1908 and 1913

COMPANY LIMITED BY SHARES

EXTRAORDINARY RESOLUTION

(Pursuant to Section 69 of the Companies (Consolidation)  
Act 1908)

of

the Edison Swan Electric Company Limited

Passed 17th February 1919.

At an Extraordinary General Meeting of the "A" Shareholders of The Edison Swan Electric Company Limited duly convened and held at Winchester House Old Broad Street in the City of London on Monday the 17th day of February 1919 the following Resolution was duly passed as an Extraordinary Resolution:-

RESOLUTION.

"That for the purpose of raising additional Working Capital the Company shall be at liberty to convert all the existing "A" Shares issued and unissued into Ordinary Shares of £1 each and to consolidate the 23564 "B" Shares 5/- paid into 5891 Shares of £1 each and to convert them when so consolidated into Ordinary shares of £1 each fully paid. And further to convert the unissued 26436 "B" Shares of £5 each into 132,180 Ordinary Shares of £1 each. And for further effecting that purpose the holders of existing "A" Shares agree to and hereby surrender and release all their rights in respect of cumulative preference dividends past present and future in order that all such new Shares shall rank pari passu with the "A" Shares when so converted as Ordinary Shares without preference or right to cumulative dividends".

"That for completing such conversion of the "A" Shares into Ordinary shares the existing "A" Share Certificates be called in by the Directors and cancelled and new Certificates issued therefor".

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Q2  
Dated this 11th day of March 1919

R.H.Parker

Secretary

123/125 Queen Victoria Street London E.C.4

I certify that the above is a true full and complete copy of the  
resolutions referred to

For The Edison Swan Electric Co. Ltd.

R. H. PARKER

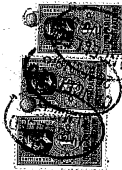
Secretary

✓ Dated this 11th day of March 1919.

*do*

(11)

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No. of Certificate 18984C/75  
Registered  
31762  
12 Mar. 1919



The EDISON SWAN ELECTRIC COMPANY LIMITED

THE COMPANIES ACTS 1908 and 1913.

COMPANY LIMITED BY SHARES

SPECIAL RESOLUTIONS

(Pursuant to Section 69 of the Companies (Consolidation) Act 1908

of

THE EDISON SWAN ELECTRIC COMPANY LIMITED

Passed 17th February 1919

Confirmed 10th March 1919.

At an Extraordinary General Meeting of the Members of The Edison Swan Electric Company Limited duly convened and held at Winchester House Old Broad Street in the City of London on Monday the 17th day of February 1919 the following Resolutions were duly passed as Extraordinary Resolutions; and at a subsequent Extraordinary General Meeting of the above named Company also duly convened and held at 123/125 Queen Victoria Street in the City of London on Monday the 10th day of March 1919 the following Extraordinary Resolutions were duly confirmed:-

RESOLUTIONS.

1. "That the 23564 "B" Shares 5/- paid be consolidated into 3891 Shares of £1 each fully paid".
2. "That each of the unissued 26436 "B" Shares of 25 each be divided into 5 shares of £1 each".
3. "That the 138071 Shares resulting from such consolidation and division be converted into Ordinary Shares and be numbered 460237 to 598307 inclusive".
4. "That for completing such consolidation and conversion of the "B" Shares 5/- fully paid the existing Share Certificates be called in by the Directors and cancelled and new Certificates issued therefor".
5. "That the Articles of Association of the Company be amended as follows:-

(1) By striking out the letter "A" on the sixth line of Article 80 and

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C43

- substituting therefor the word "Ordinary".
- (2) By striking out from Article 85 the words commencing "First Preference Share" down to the end of the Article and substituting therefor the words "Share held by him".
- (3) By striking out from Article 98 the letter "A" in the second line and the words in the third line commencing "or 4000 "B" Shares" down to the words "the other" in the fourth line.
- (4) By striking out from Article 99 the letter "A" in the third line and substituting therefor the word "Ordinary".
- (5) By inserting in Article 131 Sub section (1) (b) the words "former issued" after the words "dividends upon the" and by striking out the word "and" at the end of such sub section and substituting therefor the words "now represented by 376232 Ordinary Shares of £1 each fully paid and 21895 Ordinary Shares of £1 each 12/- paid".
- (6) By striking out the whole of Sub Section 5 of Article 131 and substituting therefor the following; "(5) In carrying to the Reserve Fund such further sum as the Directors shall think fit" and by striking out from Sub section (6) of the same Article the words "A and B" and substituting therefor the word "Ordinary".
- (7) By striking out from Article 153 the words in the fifth line commencing "and in the second place" down to the end of the Article and substituting therefor the words "and the residue shall be distributed between the holders of the Ordinary Shares".

Dated the 11th day of March 1919 R. H. PARKER

Secretary.

123/125 Queen Victoria Street London E.C.4.

I certify that the above is a true full and complete copy of the Resolutions referred to

For The Edison Swan Electric Co. Ltd.

Dated this 11th day of March 1919.

R.H:Parker  
Secretary.

(11)



Edison - Swan Elec. Light Company

Exhibit - C

Summary of Share Capital & Shares -  
Edison Electric Light Co. - June 13, '83  
Ed. & Swan Limited Elec. Light Co. -  
Nov. 11, '84  
to Aug. 10, '86

THE REDUCTION RATIO FOR THIS DOCUMENT IS 15:1

## FORM E

Registered  
9062.  
22 Jun 1883

18492/WL. P. 630816-1.600-□□. 171/1-1.3.94-□□.1.16

List of Persons holding Shares in the Edison Electric Light  
Company Limited, on the thirtieth day of June  
the date of the last Return, or (in the case of the first Return) of the  
an Account of the Shares so held.

Folio in Register Ledger containing Particulars	NAMES, ADDRESSES AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
1	Agnew	John Henry	5 Mount, Manchester	Com Agent
2	Amos	James	2 Greenfield Place W.	
3	Armstrong	Benjamin	101 Greenfield Place W.	
4	"	"	101 Greenfield Place W.	
5	"	"	101 Greenfield Place W.	
6	"	"	101 Greenfield Place W.	
7	"	"	101 Greenfield Place W.	
8	"	"	101 Greenfield Place W.	
9	"	"	101 Greenfield Place W.	
10	"	"	101 Greenfield Place W.	
11	"	"	101 Greenfield Place W.	
12	"	"	101 Greenfield Place W.	
13	"	"	101 Greenfield Place W.	
14	"	"	101 Greenfield Place W.	
15	"	"	101 Greenfield Place W.	
16	"	"	101 Greenfield Place W.	
17	"	"	101 Greenfield Place W.	
18	"	"	101 Greenfield Place W.	
19	"	"	101 Greenfield Place W.	
20	"	"	101 Greenfield Place W.	
21	"	"	101 Greenfield Place W.	
22	"	"	101 Greenfield Place W.	
23	"	"	101 Greenfield Place W.	
24	"	"	101 Greenfield Place W.	
25	"	"	101 Greenfield Place W.	
26	"	"	101 Greenfield Place W.	
27	"	"	101 Greenfield Place W.	
28	"	"	101 Greenfield Place W.	
29	"	"	101 Greenfield Place W.	
30	"	"	101 Greenfield Place W.	
31	"	"	101 Greenfield Place W.	
32	"	"	101 Greenfield Place W.	
33	"	"	101 Greenfield Place W.	
34	"	"	101 Greenfield Place W.	
35	"	"	101 Greenfield Place W.	
36	"	"	101 Greenfield Place W.	

NOTE - This margin is reserved for binding, and must not be written across.

1982, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and

ACCOUNT OF SHARES					
* Number of Shares held by each Member at date of Return †	Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members.		Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be Members.		REMARKS
	Number †	Date of Registration of Transfer	Number †	Date of Registration of Transfer	
500					
500					
63					
63					
62					
362					
500					
500					
250	250	April 27			
50					
100					
100					
250	250	April 14			
300	200	March 27			
100					
200					
100					
5000					
5000 "B"					
5000 "B"					
17.000					

(Signature)

(State whether Manager or Secretary)

\* The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the columns must be added up throughout, so as to make one total to agree with that stated in the Summary to have been taken up.  
† When the Shares are of different classes these columns may be sub-divided, so that the numbers of each class held, or transferred, may be shown separately. The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferor may be inserted in the "Remarks" column, immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison Electric Light  
Company Limited, on the fourth day of June  
the date of the last Return, or (in the case of the first Return) of the  
an Account of the Shares so held.

Folio in Register Ledger, containing Particulars	NAMES, ADDRESSES AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
39	Edison	Thomas Alva	65 Fifth Avenue, N. Y.	
47	Heming	John Ambrose	3 Greenleaf Village Hampstead	
48	Truitt	William	38 Grosvenor Square W.	M. P.
50	Truitt	Edward	West Hill Putney Road Surrey.	
52	Hendland	Edward	Leicester & St. Dept. Street Kensington W. 8.	M. P.
56	Gilbert	Howard	4 Grosvenor Square W.	Merchant
57	Guthrie	John	108 Piccadilly W.	
58	Gilbert	Algermon	4 Grosvenor Square W.	
59	Giant	Thomas	104 West George St. Glasgow	
64	Hughes	John	4 Whitechapel Road London E. 1.	M. P.
65	Hunter	William	57 Holborn Viaduct W.	Engineer
66	Hunter	Samuel	60 Lincoln Street W.	Dr. C.
67	Harvey	Edward	4 Finsbury Lane E.	Merchant
69	Harris	Alfred	20 Finsbury Lane E.	
71	Jackson	Raymond	11 Queen Victoria St. E.	
72	Johnson	Edward	57 Holborn Viaduct W.	Technical Engineer
88	Keyland	Edmund	49 Prince's Gate S.W.	Membership Council
89	Kilmer	John	15 Lombard St. E.	Banker
98	Moore	Michael	83 Lombard St. E.	Merchant

NOTE.—This margin is reserved for binding, and must not be written across.

1883, and of Persons who have held Shares therein at any time since incorporation of the Company, showing their Names and Addresses, and

ACCOUNT OF SHARES					
* Number of Shares held by existing Members at date of Return †	† Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members.		† Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be Members.		REMARKS
	Number †	Date of Registration of Transfer	Number †	Date of Registration of Transfer	
17,000					
2,000					
10	40	May 25 <sup>th</sup>			
100	400	March 30 <sup>th</sup>			
250					
100					
200	200	April 14 <sup>th</sup>			
500	100	9 <sup>th</sup>			
200					
5					
200					
20					
150					
50					
200					
450	50	March 23 <sup>rd</sup>			
500					
500					
700	20	July 15 <sup>th</sup> /83			
500	100	4 <sup>th</sup> 5 <sup>th</sup>			

23715.

(Signature)

(State whether Manager or Secretary.)

\* The aggregate Number of Shares held, and not the Fractional Number, must be stated, and the columns must be added up throughout, so as to make one total in agree with that stated in the Summary to have been taken up.  
† When the Shares are of different classes there shall be so divided so that the numbers of each class held, or transferred, may be shown separately.  
‡ The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferee may be inserted in the "Remarks" column, immediately opposite the particulars of each Transfer.



List of Persons holding Shares in the Edison Electric Light  
Company Limited, on the thirteenth day of June  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Ledger, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
176	White	Arnold Henry	18 Church Road Hampstead	Solicitor
176	Winterbottom	W. Howard	1 New Court Carey St W.C.	
177	Wackintosh	Nelson	Hartley Grange Windfield, Hants	
68	Harris	Edward	22 Duke St S.W.	
97	Hacker	William	Laeford Iron Works, Manchester	

NOTE.—This margin reserved for binding, and must not be written across.

1883, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES				REMARKS
*Number of Shares held by existing Members at date of Return	Particulars of Shares Transferred since the date of the last Return, or in the case of the first Return) of the incorporation of the Company, by persons who are still Members.	Particulars of Shares Transferred since the date of the last Return, or in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be Members		
Number†	Date of Registration of Transfer	Number	Date of Registration of Transfer	
29,310				
500				
90				
100				
30,000				
		1400	Nov 30 <sup>th</sup>	These 1400 shares were acquired on 30 <sup>th</sup> 11/1883
		250 } 250 }	Oct 13/1882 Nov 26 <sup>th</sup>	7 immediately transferred 500 shares allotted on 27 <sup>th</sup> April 1882

The occupations of the shareholders are given  
to the best of my ability.

For the Edison Electric Light Company Limited  
(Signature) H. A. Vickers  
(State whether Manager or Secretary) Acting Secretary

\*The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout so as to make one total to agree with that stated in the Summary to have been taken up.  
†When the Shares are of different classes these columns may be subdivided so that the number of each class held, or transferred, may be shown separately, opposite the name of the Transferee, and not opposite that of the Transferee, but the name of the Transferee may be inserted in the "Remarks" column immediately opposite the particulars of each Transfer.





List of Persons holding Shares in the Edwin and Susan Limited  
Company Limited, on the eleventh day of November  
the date of the last Return, or (in the case of the first Return) of the  
an Account of the Shares so held.

Folio in Register Ledger, containing Particulars	NAMES, ADDRESSES AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
101	Amson		5 Granville Place London	Discount
731	Arthur	Henry R.	13 Bromley Road, Lea, Kent	Accountant
719	Burt	Thomas Wm.	20 St. Michael's St. London	Merchant
703	Butcher	Richard	Christians Church Lane London	Builder & Joiner
728	Byrd	Frank	6 St. James's London	Politician
715	Edwin Electric	Light Company	11, St. John's St. London	Electrician
717	Edwards	James	11, St. John's St. London	Electrician
705	Edwards	James	11, St. John's St. London	Electrician
707	Edwards	James	11, St. John's St. London	Electrician
729	Edwards	James	11, St. John's St. London	Electrician
709	Edwards	James	11, St. John's St. London	Electrician
714	Edwards	James	11, St. John's St. London	Electrician
721	Edwards	James	11, St. John's St. London	Electrician
703	Edwards	James	11, St. John's St. London	Electrician
713	Edwards	James	11, St. John's St. London	Electrician
711	Edwards	James	11, St. John's St. London	Electrician
1	Edwin Electric	Light Company	11, St. John's St. London	Electrician
51	Edwin Electric	Light Company	11, St. John's St. London	Electrician

NOTE—This margin is reserved for binding, and must not be written across.

Electric Light  
1984, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and

* Number of Shares held by existing Members at date of Return †	ACCOUNT OF SHARES		REMARKS	
	Number †	Date of Registration of Transfer	Number †	Date of Registration of Transfer
400	Lilly			
1				
200				
200				
1				
8777				
200				
200				
200				
1				
200				
11338				
200				
200				
1				
40,000	Lilly			
49,261				

NOTE—This margin is reserved for binding, and must not be written across.

200,000 p. 10th Nov. 1884.

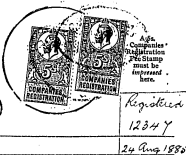
(Signature) S. Lord Ruge  
(State whether Manager or Secretary) Secretary

\* The aggregate Number of Shares held, and not the Distributive Members, must be stated, and the column must be added up throughout, so as to make one total in agree with that stated in the Summary to have been taken up.  
† When the Shares are of different classes these columns may be subdivided, so that the numbers of each class held, or transferred, may be stated separately. The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Distributive should be placed opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferee may be inserted in the "Remarks" column, immediately opposite the particulars of each Transfer.

## "THE COMPANIES ACTS, 1908 to 1917."

## FORM E

as required by Part II. of the Companies (Consolidation) Act, 1908,  
(Section 26), and the Companies (Particulars as to Directors) Act, 1917.



## Summary of Share Capital and Shares of the

Edison and Swan United Electric Light

Company, Limited, made up  
to the fourteenth day of August 1885 19— (being the four-  
teenth day after the date of the First Ordinary General Meeting in 19—)

Nominal Share Capital, £1000.000 Divided into\* 200.000 Shares of 5 each

Total Number of Shares taken up\* to the 14<sup>th</sup> day of August 1885 19— (which  
number must agree with the total shown in the list, as held by existing members) 17111 Fully Pd.  
8926 Partly Pd.

Number of Shares issued subject to payment wholly in cash.....

Number of Shares issued as fully paid up otherwise than in cash.....

Number of Shares issued as partly paid up to the extent of \_\_\_\_\_ per share  
otherwise than in cash.....

‡ There has been called up on each of fully paid Shares 5 £85.05

" " " partly paid " 2 £267.83

" " " " " " £

§ Total amount of Calls received, including payments on application and allotment..... £3534.88

Total amount (if any) agreed to be considered as paid on \_\_\_\_\_ Shares which have  
been issued as fully paid up otherwise than in cash..... £

Total amount (if any) agreed to be considered as paid on \_\_\_\_\_ Shares which have  
been issued as partly paid up to the extent of \_\_\_\_\_ per Share otherwise  
than in cash..... £

Total amount of Calls unpaid..... £ Nil

Total amount (if any) of sums paid by way of Commission in respect of shares or debentures  
or allowed by way of Discount since the date of last Summary..... £

Total amount (if any) paid on \_\_\_\_\_ Shares forfeited..... £ Nil

Total amount of Shares and Stock for which Share Warrants to bearer are { Shares .. £  
outstanding ..... { Stock .. £

Total amount of Share Warrants to bearer issued and surrendered { Issued ..... £  
respectively since date of last Summary ..... { Surrendered ..... £

Number of Shares or amount of Stock comprised in each Share { Number of Shares.... £  
Warrant to bearer ..... { Amount of Stock .... £

Total amount of debt due from the Company in respect of all mortgages and charges which  
are required (or, in the case of a Company registered in Scotland, which, if the  
Company had been registered in England, would be required) to be registered with  
the Registrar of Companies, or which would require registration if created after the  
first day of July, 1908..... £

Note.—Banking Companies must add a list of all their places of business.

\* Where there are Shares of different kinds or amounts (e.g., Preference and Ordinary, or £10 and £5) state the number and nominal values separately.  
† Where various amounts have been called, or there are Shares of different kinds, state them separately.  
‡ Including what has been received on forfeited, as well as on existing, Shares.  
§ State the aggregate number of Shares forfeited (if any).

The return must be signed, at the End, by the Manager or Secretary of the Company.

Presented for filing by W. Charles Fowler

57, Holborn Viaduct E.C.

List of Persons holding Shares in the Electric and Swan United  
Company Limited, on the fourteenth day of August  
the date of the last Return, or (in the case of the first Return) of the  
an Account of the Shares so held.

Folio in Register Leger, containing Particulars	NAMES, ADDRESSES AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
163	727	Swan United Electric Light Co.	42, 54 Nelson Street S.E.	
	717	Fisher	Greenwich S.W.	Gentleman
	720	Waters	5 Berlin Place S.W.	Gentleman
393	261	Wilmers	J. H.	26 Nassau St. New York
	731	Archib	Henry Robert	13 Bromley Rd. S.E.
	747	Bart	Wm.	20 St. Mark's St. S.E.
	748	Crisp	Wm.	6 St. John's
	749	Page	Sam. Hood	2, 10 St. John's
	751	Swan	John	75 St. John's Rd. S.E.
715	1	Electric Light Co.	42, 54 Nelson Street S.E.	
1	701	Swan	5 Nassau St. S.W.	
3	61	Agnew	5 Mount Mansfield	Am. Agent
5	65	Wilmers	2 St. John's Place S.W.	Gentleman
7	69	Wilmers	2 St. John's Place S.W.	Gentleman

NOTE—This margin is reserved for binding, and must not be written across.

Electric Light  
1885, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and

ACCOUNT OF SHARES					
* Number of Shares held by existing Members at date of Return †	Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members.		Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be Members.		REMARKS
	Number †	Date of Registration of Transfer	Number †	Date of Registration of Transfer	
605.99	200				
200	1125				
1	200				
1	1				
1	200				
996	1400-14	Mar. 28 1883			
1125	1400	" 14th Nelson Street S.E.			
843					
225					
141					

NOTE—This margin is reserved for binding, and must not be written across.

65887

(Signature)

(State whether Manager or Secretary)

\* The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout, so as to make one total to agree with that stated in the Summary to have been taken up.  
† When the Shares are of different classes these columns may be subdivided so that the numbers of each class held, or transferred, may be shown separately. The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferor may be inserted in the "Remarks" column, immediately opposite the particulars of each Transfer.

These 1400 shares are transferred in distribution of the shares specified by the dividend certificate of the company to the members of the company (see the following names)

List of Persons holding Shares in the Edison & Swan United  
Company Limited, on the fourteenth day of August  
the date of the last Return, or (in the case of the first Return) of the  
an Account of the Shares so held.

Folio in Register Larger, containing Particulars	NAMES, ADDRESSES AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
9 72	Armitage	Edmund	Hooking Rindleton	Gentleman
11 74	Armitage	Joseph J.	Hooking Lids "	"
13 81	Armitage	Samuel	Hooking Lids Rindleton	"
15 88	Ashby	Harriet	6 Knighton Hill Backbury	Quinier
17 89	Ashby	Sam	same address	Quinier
101 102	Bidwell	Richard	Hooking Lodge Groundwood	Quinier
103 93	Barred	Howard	3 Laidlaw Street W.	Quinier
105 97	Benson	Robert Henry	4 Bishopsgate St.	"
107 100	Birchall	John Deane	Bowden Hall Worcester	"
109 105	Birchall	Robert	20 Brindley Square N.	"
111 107	Black	George	21 Brindley Row North	Solicitor
113 113	Blumfield	James	10 Hyde Park Gate N.	Gentleman

NOTE—This margin is reserved for binding, and must not be written across.

Electric Light  
1915, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and

ACCOUNT OF SHARES				REMARKS
* Number of Shares held by existing Members at date of Return †	† Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members.	† Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be Members.		
Number †	Date of Registration of Transfer	Number †	Date of Registration of Transfer	
65857				
141				
139				
814				
45				
45				
1125	200	28 March 1885		
22				
225				
225				
450				
113				
225				
69426				

NOTE—This margin is reserved for binding, and must not be written across.

(Signature)

(State whether Manager or Secretary)

\* The aggregate Number of Shares held, and not the Distinctive Number, must be stated, and the column must be added up throughout, so as to make one total to agree with that stated in the Summary to have been taken up.  
† When the Shares are of different classes these columns may be subdivided so that the numbers of each class held, or transferred, may be shown separately.  
‡ The date of Registration of each Transfer should be given, as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferee may be inserted in the "Remarks" column, immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison & Swan United  
Company Limited, on the fourteenth day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Ledger, containing Particulars	NAMES, ADDRESSES AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
115 117	Bramerie	Edw. Heyes	146 Milton Crescent St.	Boys' Committee
117 121	Bramwell	Mr. Loder	5 St George St. Westminster	Engineer
201 128	Burt	W. H. H. H. H.	Long Street 106	Teacher
203 129	Caymore	Henry	52 Kensington St. W.	Teacher
205 130	Chadwick	James	17 Park Lane St. W.	Teacher
207 137	Crawford	James	17 Park Lane St. W.	Teacher
209 141	Edwards	Edwards	17 Park Lane St. W.	Teacher
211 143	Douglas	John	22 St. James St. W.	Teacher

NOTE—This margin is reserved for binding, and must not be written across.

Electric Light

1915, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES						REMARKS
*Number of Shares held by existing Members at date of Return	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members		‡Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members			
	Number	Date of Registration of Transfer	Number	Date of Registration of Transfer		
69426						
1125						
562						
225						
225						
135						
450						
562						
5,625	1,125	March 28, 1885				to Edwards
	1,125	April 21				to L. P. Harris
	563	May 19				to J. V. McManis
	281	May 19				to H. Lewis
	281	May 19				to J. S. Newbold
	396					

\*The aggregate Number of Shares held, and not the Dividend Numbers, must be stated, and the column must be added up throughout so as to make one  
total to agree with that stated in the Summary to have been taken.  
†When the Shares are of different classes these columns may be added so as to show that the number of each class held, or transferred, may be shown separately.  
‡The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed  
opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferor may be inserted in the "Remarks"  
column immediately opposite the particulars of each Transfer.

(Signature)

(State whether Manager or Secretary)

Y8335

List of Persons holding Shares in the Edison and Swan United  
Company Limited, on the fourteenth day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Ledger, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
	Douglas	John	22 Old Broad St. E.C.	
273 149	Sumner	Jeremiah	54 Rochester Lane W.	Gentleman
311 153	Ferguson	Robert	Hadley Ho. South Bedford	Gentleman
313 157	Henning	John Ambrose	57 Holborn Viaduct E.C.	Broker of Exchanges
315 161	Lynde	William	38 Grosvenor Square W.	M. P.
317 165	Handlans	Edward	Regent Hill	Al. & F.R.S.
319 169	Lich	Mary Ann		
	Lich	G.		
	Lich	J. H.		
	Lich	James		
	Lich	James	West Hill Putney Beach	Gentleman
361 178	Garthorn	Paul	42 Old Broad St. E.C.	Gentleman
363 179	Belair	Howard	4 Grosvenor Square W.C.	Merchant

NOTE.—This margin is reserved for binding, and must not be written across.

Electric Light

1955, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

NOTE.—This margin is reserved for binding, and must not be written across.

ACCOUNT OF SHARES

*Number of Shares held by existing Members at date of Return†	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members	Number†	Date of Registration of Transfer	Number†	Date of Registration of Transfer	REMARKS
78335	2250	April 20 1875					6 J. M. H. Hargis
450							
45							
22							
228							
225							
562							
56							
450							
80370							

(Signature) \_\_\_\_\_  
(State whether Manager or Secretary) \_\_\_\_\_

(Signature)

(State whether Manager or Secretary)

\*The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout so as to make one total to agree with that stated in the Summary to have been taken up.  
†When the Shares are of different classes these columns may be subdivided so that the number of each class held, or transferred, may be shown separately.  
‡The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferee may be inserted in the "Remarks" column immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison and Swan United  
Company Limited, on the fourteenth day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Lodge, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
365 181	Goldsomid	Li Julia	105 Piccadilly W.	Baronet
367 185	Grant	Charles John	108 Wood George St Glasgow	Agent
369 381	Gilliat	Hegemon	4 Grosby Square E.C.	Engineer
411 189	Hamley	Adolphus	7 Mincing Lane E.C.	Engineer
413 193	Harding	Wm Adolphus	50 Grove La. Camberwell	Engineer
415 197	Harris	Alfred	Kirkby Donadale Wood	Engineer
417 201	Hammer	James	26 Hogshead Lane E.C.	Engineer
419 205	Heywood	Eli	Springfield Blackburn	Engineer
421 209	Hopkinson	John	4 Westminster Chm. W.	Director of Firm
423 213	Hoare	Samuel	7 Hereford Gardens W.	Banker
425 217	Jackson	J. Raphael	11 Queen Victoria St E.C.	Engineer
425 218	Harris	Philip	1 Broadway New York	Engineer

NOTE.—This margin is reserved for binding, and must not be written across.

Electric Light

• 1856, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES					REMARKS
*Number of Shares held by existing Members at date of Return	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members	‡Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members	Number	Date of Registration of Transfer	
80370					
1125					
11					
450					
112					
292					
450					
146					
337					
450					
337					
450					
1125					

NOTE.—This margin is reserved for binding, and must not be written across.

83655

(Signature)

(State whether Manager or Secretary)

\*The aggregate Number of Shares held, and not the Distinction Numbers, must be stated, and the column must be added up throughout so as to make one total to agree with that stated in the Summary to have been taken up.  
†When the Shares are of different classes these entries may be subdivided so that the number of each class held, or transferred, may be shown separately.  
‡The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be entered opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferor may be inserted in the "Remarks" column immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison and Swan United  
Company Limited, on the fourteenth day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Ledger, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS				
	Surname	Christian Name	Address	Occupation	
427 369	Harpis	John Henry	31 R. Housman Paris	Engineer	NOTE.—This margin is reserved for binding, and must not be written across.
429 373	Hammes	Wm Joseph	65 2nd Avenue New York	Engineer	
515 768	Hayward	Edw Richard	49 Prince Gate S.H.	Engineer	
517 221	Landon	Wm Woodman	26 Thrapston St E.C.	Engineer	
519 228	Hidderdale	William	2 Church Avenue E.C.	Engineer	
511 220	Lutbach	Edwin	15 Lombard St E.C.	Banker N.R.	
513 231	Lutbach	Benjamin W.	15 Lombard St E.C.	Engineer	
518 273	Lewis	Henry	237 Chestnut St Philadelphia	Engineer	
561 237	Heller	John Livingston	Hanson Brewery France	Engineer	
513 241	Moore	Nicholas Miles	6 Lombard St E.C.	Merchant	
565 389	Hoschey	Charles	Holly Bank Manchester	Engineer	
623 249	Rice	Samuel Howell	44 Graham St E.C.	Accountant	

Electric Light

1985, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES					REMARKS
*Number of Shares held by existing Members at date of Return	Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members	2*Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members	Number	Date of Registration of Transfer	
85655					to Edison & Swan Co.
2250					
45					
1575	200	28 March 1885			
112					
225					
1,125					
112					
281					
225					
450					
1,125					
373					
93553					

(Signature)

(State whether Manager or Secretary)

\*The aggregate Number of Shares held, and not the Dividend Numbers, must be stated, and the column must be added up throughout so as to make one total to agree with that stated in the Summary to have been taken up.  
\*When the Shares are of different classes these columns may be sub-divided so that the number of each class held, or transferred, may be shown separately.  
\*The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferee may be inserted in the "Remarks" column immediately opposite the particulars of each Transfer.



List of Persons holding Shares in the Edison and Swan United  
Company Limited, on the fourteenth day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Ledges, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
611 377	Newbold	John Smith	300 Walnut St. Philadelphia U.S.A.	Engineer
613 373	Newell	Charles Henry	19 George St. Manchester	Electrician
621 245	Porter	Thomas	Brighthelm Brighton Road	Engineer
635 253	Pryer	William Henry	12 Great Winchester St. E.C.	Merchant
661 357	Rackbone	Thos. Arthur	21 Water St. Liverpool	Engineer
683 261	Rackbone	James Greg.	21 Water St. Liverpool	Engineer
688 265	Rackbone	William	Green Bank Liverpool	Engineer
697 269	Rackbone	Wm. Gair	2 Fincham Road E.C.	Engineer
697 173	Reed	Eliza G. Smith	9 Drapers Gardens E.C.	Engineer
691 277	Rennie	William	16 Headenhall St. E.C.	Engineer
692 281	Rohinson	Thomas George	Nat. Prov. Bank London	Engineer
751 285	Scott	Andrew Reid	21 Kensington Gardens	Electrician

NOTE.—This margin is reserved for binding, and must not be written across.

Electric Light

- 1885, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES					REMARKS
*Number of Shares held by existing Members at date of Return	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members		‡Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members		
	Number	Date of Registration of Transfer	Number	Date of Registration of Transfer	
93553					
281					
112					
480					
675					
56					
225					
225					
68					
90					
225					
45					
225					
96330					
(Signature) _____					
(State whether Manager or Secretary) _____					

\*The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout so as to make one

total in agree with that stated in the Summary to have been taken up.

†When the Shares are of different classes (such columns may be sub-divided so that the number of each class held, or transferred, may be shown separately.

‡The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed

opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferee may be inserted in the "Remarks"

column immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison and Swan United  
Company Limited, on the fourteenth day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Ledger, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
752 289	Scott	Ephraim Richd	9 Drapers Gardens E.C.	Gentleman
755 293	Stewart	Charles James	4 Adams Court E.C.	Gentleman
757 297	Stewart	John	Wat. Row Bank London E.C.	Gentleman
759 301	Stuart	Byre Massey	Two Bishops Southwark	Gentleman
761 305	Stone	Edw. Michael	9 St. Michaels Court E.C.	Gentleman
765 307	Smith	Charles Thomas	Field House, Bradford	Gentleman
851 309	Thomson	W. William	University Glasgow	Gentleman
853 313	Tynging	Charles Park	Leam Road	Gentleman
859 317	Waldenhouse	Arthur	20 New Bond St E.C.	R. A.
915 317	Wade	Leit Henry	18 Old Broad St E.C.	Gentleman
917 321	Wade	Richard Henry	13 Seymour St E.C.	Gentleman

NOTE.—This margin is reserved for binding, and must not be written across.

Electric Light

1888, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES						REMARKS
*Number of Shares held by existing Members at date of Return†	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members		†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members			
	Number†	Date of Registration of Transfer	Number	Date of Registration of Transfer		
96330						
101						
112						
697						
112						
450						
225						
337						
562						
1125						
225						
562.						
100838						
(Signature)_____						
(State whether Manager or Secretary)_____						

\*The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout so as to make one total in agree with that stated in the Summary to have been taken up.  
†When the Shares are of different classes these columns may be subdivided so that the number of each class held, or transferred, may be shown separately.  
‡The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferor, and not opposite that of the Transferee, but the name of the Transferee may be inserted in the "Remarks" column immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison and Swan United  
Company Limited, on the fourteenth day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Ledger, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
719 328	Watkinson	William	Hardley Grange, Winkfield	Gentleman
721 333	Waterhouse	Edwin	44 Grosvenor St. E.C.	Accountant
723 337	Waterhouse	Isaac Dewden	High Lea, Winkfield, E.C.	Merchant
725 341	Waterhouse	Theodore	1 New Court, Carey St.	Electrician
727 345	Watson	W. Clarence	7 St. Michael's St. E.C.	Gentleman
729 349	White	Arnold May	Devonshire White St. E.C.	Gentleman
731 353	White	Leah Evelyn	Kennel St. Cromwell Rd.	Gentleman
733 357	Winkfield	Wm. Howard	1 New Court, Carey St. W.C.	Electrician
735 401	Williamson	Isaac Bennett	20 Bank St. Philadelphia E.C.	Gentleman
	Whithead	Marie Emma		
	Thomas	Edith Charles		
		Executive of		
737 405	Whithead	John		Gentleman

NOTE.—This margin is reserved for binding, and must not be written across.

Electric Light

1888, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES					
*Number of Shares held by existing Members at date of Return†	Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still members		Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members		REMARKS
	Number†	Date of Registration of Transfer	Number†	Date of Registration of Transfer	
100838					
225					
1125					
1237					
1125					
472					
220					
373					
112					
569					
112					
106,402					

For and behalf of  
The Edison and Swan United Electric  
Light Company Limited.  
(Signature) John L. Hood Page  
(State whether Manager or Secretary) Secretary

\*The aggregate Number of Shares held, and not the Dispositive Numbers, must be stated, and the column must be added up throughout to be added and  
total to agree with that stated in the Summary to have been taken up.  
†When the Shares are of different classes these columns may be subdivided so that the number of each class held, or transferred, may be shown separately.  
‡The date of Registration of each Transfer should be given, as well as the Number of Shares transferred on each date. The Particulars should be placed  
opposite the name of the Transferee, not the opposite that of the Transferor, but the name of the Transferee may be inserted in the "Remarks"  
column immediately opposite the particulars of each Transfer.

Certificate No.

18984/9

Registered  
13250.  
17 Aug 1886Pence.  
6d.]

## "THE COMPANIES ACTS, 1908 to 1917."

## FORM E

as required by Part II. of the Companies (Consolidation) Act, 1908,  
(Section 26), and the Companies (Particulars as to Directors) Act, 1917.

## Summary of Share Capital and Shares of the

Edison and Swan United Electric Light Company, Limited, made up  
to the tenth day of August 1886 (being the four-  
teenth day after the date of the First Ordinary General Meeting in 1886).

Nominal Share Capital, £ 1,000,000 Divided into\* 200,000 Shares of £ 5 each

Total Number of Shares taken up\* to the 10<sup>th</sup> day of August 1886 (which  
number must agree with the total shown in the list, as held by existing members)

17,139 Fully paid  
89,261 £3 paid  
23,564 B £5.12

Number of Shares issued subject to payment wholly in cash.....

Number of Shares issued as fully paid up otherwise than in cash.....

Number of Shares issued as partly paid up to the extent of \_\_\_\_\_ per share  
otherwise than in cash.....

† There has been called up on each of Ordinary Shares £3 per share £ 267,783

" " " Fully paid " £5 per share £ 85,675

" " " B Fully paid " £5 per share £ 117,820

§ Total amount of Calls received, including payments on application and allotment..... £ 471,298

Total amount (if any) agreed to be considered as paid on \_\_\_\_\_ Shares which have  
been issued as fully paid up otherwise than in cash..... £ \_\_\_\_\_

Total amount (if any) agreed to be considered as paid on \_\_\_\_\_ Shares which have  
been issued as partly paid up to the extent of \_\_\_\_\_ per Share otherwise  
than in cash..... £ \_\_\_\_\_

Total amount of Calls unpaid..... £ Nil.

Total amount (if any) of sums paid by way of Commission in respect of shares or debentures  
or allowed by way of Discount since the date of last Summary..... £ \_\_\_\_\_

Total amount (if any) paid on \_\_\_\_\_ Shares forfeited..... £ Nil.

Total amount of Shares and Stock for which Share Warrants to bearer are { Shares .. £ \_\_\_\_\_  
outstanding ..... Stock .. £ \_\_\_\_\_

Total amount of Share Warrants to bearer issued and surrendered { Issued ..... £ \_\_\_\_\_  
respectively since date of last Summary ..... Surrendered ..... £ \_\_\_\_\_

Number of Shares or amount of Stock comprised in each Share { Number of Shares.... £ \_\_\_\_\_  
Warrant to bearer ..... Amount of Stock .... £ \_\_\_\_\_

Total amount of debt due from the Company in respect of all mortgages and charges which  
are required (or, in the case of a Company registered in Scotland, which, if the  
Company had been registered in England, would be required) to be registered with  
the Registrar of Companies, or which would require registration if created after the  
first day of July, 1908..... £ \_\_\_\_\_

Note.—Banking Companies must add a list of all their places of business.

- \* Where there are Shares of different kinds or amounts (e.g., Preference and Ordinary, or £10 and £5) state the number and nominal values separately.
- † Where various amounts have been called, or there are Shares of different kinds, state them separately.
- ‡ Include what has been received on forfeited, as well as on existing, Shares.
- § State the aggregate number of Shares forfeited (if any).

The return must be signed, at the End, by the Manager or Secretary of the Company.

Presented for filing by \_\_\_\_\_

List of Persons holding Shares in the Edison & Swan  
Company Limited, on the twelfth day of August  
the date of the last Return, or (in the case of the first Return) of the  
an Account of the Shares so held.

Folio in Register Leger, containing Particulars	NAMES, ADDRESSES AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
<u>Ordinary Shares.</u>				
1	Anson	Viscount	5 Cranville Place. W.	Gentleman
3	Agnew		5 Mount Manchester	Com. Agent
5	Alexander	James.	2 St Helens Pl. Lab.	Gentleman
9	Armitage	Edmund.	The Rookery, Pendleton.	do
79	Armitage	Benjamin	Chomlea, Pendleton.	do
11	Armitage	Joseph J.	Chassey Field Pendleton	do
13	Armitage	Samuel	Chassey House Pendleton	do
15	Ashby	Narrist	Buckhurst Hill	
17	Ashby	Sarah	do	
101	Bidwell	Shelford	Winstone Lodge Wandsworth	Barister
103	Barratt	Howard	3 Daintock Sq W.C.	Gent.
105	Benson.	Robert Henry	4 Bishopsgate St. E.C.	do

NOTE—This margin is reserved for binding, and must not be written across.

### United Electric Light

1886, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and

ACCOUNT OF SHARES					REMARKS
* Number of Shares held by existing Members at date of Return †	Number †	Date of Registration of Transfer	Number †	Date of Registration of Transfer	
1000					
750					
200					
126					
126					
124					
724					
40					
40					
1000					
20					
200					
4350					

(Signature)

(State whether Manager or Secretary)

\* The aggregate Number of Shares held, and not the Dispositive Numbers, must be stated, and the columns must be added up throughout, so as to make one total to agree with that stated in the Summary to have been taken up.  
† When the Shares are of different classes these columns may be subdivided so that the numbers of each class held, or transferred, may be shown separately.  
‡ The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferor, and not opposite that of the Transferee, but the name of the Transferee may be inserted in the "Remarks" column, immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison & Swan  
Company Limited, on the 10th day of August  
the date of the last Return, or (in the case of the first Return) of the  
an Account of the Shares so held.

Folio in Register Leifer, containing Particulars	NAMES, ADDRESSES AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
107	Birchall	John Dearman	Bowden Hall, Glaston.	Gent.
109	Birkbeck	Robert	20 Birkley Sq. W.	do
111	Black	George	21 Broughley Rd. N.W.	Notioner
113	Blumenthal	Jacques	15 Hyde Park Gate. S.W.	Gent.
115	Brouwerie	Rt Hon Ed. Playfair	44 Wilton Crescent. S.W.	Privy Counsellor
117	Bramwell	Edmund Joseph	5 St George St. N.W.	Engineer.
119	Barclay	Charles	112 Bishopsgate St. E.C.	Gent.
121	Brand	James	33 Old Broad St. E.C.	do
123	Brown	Thomas John	53 Devonshire Rd. S.E.	do
201	Carte	Richard Boyle	Savoy Theatre W.C.	do
203	Cagenove	Henry	52 Threadneedle St. E.C.	do
205	Chadwick	Spencer	17 Parliament St. S.W.	do

NOTE—This margin is reserved for binding, and must not be written across.

United Electric

1886, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and

ACCOUNT OF SHARES					
* Number of Shares held by existing Members at date of Return †	Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members.		Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be Members.		REMARKS
	Number †	Date of Registration of Transfer	Number †	Date of Registration of Transfer	
4350					
200					
400					
100					
200					
1000					
500					
222					
250					
50					
200					
200					
120					
7792					

(Signature)

(State whether Manager or Secretary)

\* The aggregate Number of Shares held, and not the Distinctive Number, must be stated, and the columns must be added up throughout, so as to make one total to agree with that stated in the Summary to have been taken up.  
† When the Shares are of different classes these columns may be subdivided so that the numbers of each class held, or transferred, may be shown separately.  
‡ When the date of registration of each transfer needs to be given as well as the number of Shares transferred on each date, the Particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferee may be inserted in the "Remarks" column, immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison & Swan  
Company Limited, on the 14th day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio Register Ledger, containing Particulars	NAMES, ADDRESSES AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
207	Crawson	Alfred	Springfield, Alderney Edge	Merchant
209	Cross	Edward	Bradford House, Bolton	Cotton Spinner
211	Crawson	Wilson	60 Countfield Avenue, Sec.	Gent.
213	Cross	John Hynaston	7 Iron Clough, Bolton	do
215	Cronstein	Henry	48 St. James St. Sec.	do
271	Douglas	John	22 Old Broad St. Ec	do
273	Dummett	Joseph	54 Rochester Terrace W.	do
275	Drexell	Anthony Joseph	Philadelphia U.S.A.	do
293	Edwards	J. W.	26 Nassau St. New York	do
311	Lingston	Robert	Radleigh House South, Rungby	do
313	Heming	John Ambrose	13 Albert Mansions Sec.	Dr. L.
315	Hawthland	Edward	The Yews, Reigate Hill	Gent.
315	Fowler	William	38 Grosvenor Sq. W.	do

NOTE—This margin is reserved for binding, and must not be written across.

Electric Light.

1886, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

# ACCOUNT OF SHARES

*Number of Shares held by existing Members at date of Return	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members		‡Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be Members		REMARKS
	Number	Date of Registration of Transfer	Number	Date of Registration of Transfer	
7792					
400					
500					
200					
400					
50					
2085					
2438		7562 10 May 1886			
400					
1235					
1000					
40					
20					
200					
			200		
14675					
(Signature) _____					
(State whether Manager or Secretary) _____					

\*The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout so as to make one  
total to agree with that stated in the Summary to have been taken up.  
†Where the Shares are of different classes these transfers may be subdivided so that the number of each class held, or transferred, may be shown separately.  
‡The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed  
opposite the date of the Transfer, and not opposite that of the Transferee, but the name of the Transferee may be inserted in the "Remarks"  
column immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison & Swan  
 Company Limited, on the twelfth day of August  
 the date of the last Return, or (in the case of the first Return) of the  
 Account of the Shares so held.

Folio in Register Ledger, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
✓ 319	Firth	robert	West Hill Putney Heath	Genl.
361	Gadban	Paul	112 Old Broad St.	do
363	Gilliat	Howard	4 Grosby Sq. E.C.	do
365	Gordon	his Julian	105 Piccadilly. W.	do
367	Grant.	Chas. Zosh	Glasgow.	do
369	Gilliat	Algernon	4 Grosby Sq. E.C.	do
✓ 373	Gover.	Harry Chas	Claremont Rd. Hestgate	do
375	Godfrey	Chas. Henry	New York	do
411	Hankey	Rodolph Alexander	7 Mincing Lane E.C.	do
413	Harding	William Adolphus	50 Grove Lane S.E.	do
415	Harris.	Alfred	Kirkby Roadside	do
✓ 417	Hammerde	James	26 Throgmorton St. E.C.	do
371	Govett.	Francis Alfg	4 Throgmorton Av. E.C.	do

NOTE.—This margin is reserved for binding, and must not be written across.

Electric Light

1886, and of Persons who have held Shares therein at any time since  
 incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES						REMARKS
*Number of Shares held by existing Members at date of Return†	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members		‡Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members			
	Number†	Date of Registration of Transfer	Number	Date of Registration of Transfer		
14675						
500						
50						
400						
1000						
10						
400						
100						
215						
100						
260						
500						
130						

\*The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout so as to make one total to agree with that given in the Summary to have been taken up.  
 †When the Shares are of different classes these columns may be subdivided so that the number of each class held, or transferred, may be shown separately.  
 ‡The date of registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferee may be inserted in the "Remarks" column immediately opposite the particulars of each Transfer.



List of Persons holding Shares in the Edison Swan  
Company Limited, on the tenth day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Lodge, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
419	Heyworth	Eli	Springfield, Blackburn	Genl.
421	Hopkinson	John	4 Westminster Chbrs. Sw	DSc JRS
✓ 423	Hoare	Samuel	7 Hereford Sq. W	Banker.
425	Harris	Philip P.	1 Broadway, New York	Genl.
427	Hargis	John Henry	Paris	do
429	Hammer	Wm Joseph	65 Fifth Avenue, New York	do
431	Hale	Geo Webb	Stock Exchange	do
441	Jackson	R. R.	11 Queen Victoria St. Ec	do
✓ 449	Kendall	H. I. C.	Union Bank, Prince's St. Ec	do
505	Keyland	Frederick R.	49 Prince's Gate Sw	do
507	Lander	Wm W.	26 Throgmorton St. Ec	do
509	Liddersdale	Wm	2 Fenchurch Ave Ec	do

NOTE.—This margin is reserved for binding, and must not be written across.

Electric Light  
1886, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES						REMARKS
*Number of Shares held by existing Members at date of Return†	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members		‡Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members			
	Number‡	Date of Registration of Transfer	Number‡	Date of Registration of Transfer		
18340						
300						
400						
300						
1000						
2000						
40						
46						
400						
156						
1400						
100						
200						
24682						
(Signature) _____						
(State whether Manager or Secretary) _____						

NOTE.—This margin is reserved for binding, and must not be written across.

\*The aggregate Number of Shares held, and not the Dividend Numbers, must be stated, and the column must be added up throughout so as to make one total in agree with that stated in the Summary to have been taken up.  
†When the Shares are of different classes these columns may be subdivided so that the number of each class held, or transferred, may be shown separately.  
‡The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferee may be inserted in the "Remarks" column immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison & Swan  
Company Limited, on the Fourth day of August,  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Ledger, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
511	Lubbock	Sir John	15 Lombard St. E.C.	Banker.
543	Lubbock	Beaumont Wm	15 Lombard St. E.C.	Genl.
576	Lewis	Henry	Philadelphia USA	do
561	Mellor	John P.	Strairity France	do
563	Moore	Michael Miles	6 Lombard St E.C.	do
565	Mosley	Charles	Victoria Park, Manchester	do
611	Newbould	John Smith	Philadelphia USA	do
613	Neville	Chas Henry	19 George St. Manchester.	do
621	Oldenbourg	Ernest	Wills Hill Park. W.	do
631	Porter	Thomas	White Knights, Reading	do
633	Rice	Samuel David	44 Essexham St. E.C.	do
635	Pryor.	Harbrough Robert	12 St. Winchester, St. E.C.	do

NOTE.—This margin is reserved for binding, and must not be written across.

Electric Light.

1876, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES					REMARKS
*Number of Shares held by existing Members at date of Return†	Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members	Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members	Number†	Date of Registration of Transfer	
24682					
1000					
100					
250					
200					
400					
1000					
250					
100					
50					
400					
332					
222					
28986					
(Signature)					
(State whether Manager or Secretary)					

\*The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout so as to make one total to agree with that stated in the Summary to have been taken up.  
†When the Shares are of different classes these columns may be subdivided so that the number of each class held, or transferred, may be shown separately.  
‡The date of Registration of such Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferor may be inserted in the "Remarks" column immediately opposite the particulars of such Transfer.

List of Persons holding Shares in the Edison & Swan  
Company Limited, on the tenth day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Ledger, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
637	The Pennsylvania Co			
639	Paul	James Miller	Philadelphia WSA	Genl.
681	Rathbone	Thomas Ashton	21 Water St Liverpool	do
683	Rathbone	Samuel Legg	21 Water St, Liverpool	do
685	Rathbone	William	Green Bank Liverpool	do
687	Rathbone	Wm. Gare	2 Goodchurch Ave. E.C.	do
689	Reed	E.P.S.	9 Drapers Gardens E.C.	do
691	Rennie	William	16 Hendonhall St. E.C.	do
693	Robinson	Anna George	Nat Prov. Bank, Bishopsgate E.C.	do
751	Scoble	Andrew R.	21 Kensington Gardens Terrace SW	
753	Scott	Septimus Richard	9 Drapers House E.C.	do
755	Steward	Charles James	70 Leatham Edna W	do

NOTE—This margin is reserved for binding, and must not be written across.

Electric Light.

1886, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES						REMARKS
*Number of Shares held by existing Members at date of Return†	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members	Number†	Date of Registration of Transfer	Number†	
28,986						
631						
77						
50						
200						
200						
150						
80						
200						
40						
200						
90						
100						
3,004						
(Signature)_____						
(State whether Manager or Secretary)						

\*The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout so as to make one total to agree with that stated in the Summary to have been taken up.  
†When the Shares are of different classes these columns may be sub-divided so that the number of each class held, or transferred, may be shown separately.  
‡The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferor may be inserted in the "Remarks" column immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison & Swan  
Company Limited, on the twelfth day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Ledger, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
	757	Stewart	John	Nat. Boro Bank, Bishopsgate Ec Gant.
✓	759	Shaw	Eyre Massey	The Brigade, Southwark SE do
	761	Lowe	Edward Wierand	9 St Michaels Court Ec do
	763	Swan	United Electric Light Co Ltd	13 Ballbut house Victoria St Sw.
	765	Smith	Chas Heford	Field House Bradford Gant.
✓	767	Storrsbury	Edt Edmund	Philadelphia Wtd do
	851	Thomson	h. William	The University Glasgow do
	853	Lipping	William	Brasted Park Sevenoaks <del>London</del> do
	855	Thomas	Geo. Clifford	Philadelphia Wtd do
	913	Waterhouse	alfred	20 New Cavendish St. W. do
✓	915	Wade	Leal Henry	18 Old Broad St. Ec do
	917	Wade	Rict. Blaway	13 Heymour St W do.

NOTE.—This margin is reserved for binding, and must not be written across.

# United Electric

1926, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES					REMARKS
*Number of Shares held by existing Members at date of Return	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still members		‡Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members		
	Number	Date of Registration of Transfer	Number	Date of Registration of Transfer	
31004					
620					
100					
400					
49261					
200					
77					
300					
500					
25					
1000					
200					
500					
84187					
(Signature)					
(State whether Manager or Secretary)					

(Signature)

(State whether Manager or Secretary)

\*The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout so as to make one total to agree with that stated in the Summary to have been taken up.  
†When the Shares are of different classes these columns may be subdivided so that the number of each class held, or transferred, may be shown separately.  
‡The date of Registration of each Transfer should be given or void as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferee, but the name of the Transferee may be inserted in the "Remarks" column immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison & Swan  
Company Limited, on the Tenth day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Ledges, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
919	Walkenshaw	Wm	Nortley, Grange, Windfield.	Gent.
921	Waterhouse	Edwin	44 Gresham St. Ldn. E.C.	Gent.
923	Waterhouse	Isaac C.	Olderley, Lodge	do
925	Waterhouse	Theodore	1 New Court. W.C.	do
✓ 927	Watson	Wm. Clarence	7 St. Winchester St. E.C.	do
929	White	Arnold Henry	Devonshire Club. SW	do
931	White	Fredk. Anthony	Kinross House, Cromwell Rd. W.	do
933	Winterbottom	Wm. Howard	1 New Court, W.C.	do
935	Williamson	Isiah Vincent	Philadelphia U.S.A.	do
937	Whitcomb & others			do
939	Welber.	Chas. Edward		Colonel RE
✓ 941	Wright.	Jas. Hood	New York. U.S.A.	Gent.

NOTE.—This margin is reserved for binding, and must not be written across.

Electric Light.

1886, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES					REMARKS
*Number of Shares held by existing Members at date of Return)	1 Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still members		2 Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members		
	Number	Date of Registration of Transfer	Number	Date of Registration of Transfer	
84187					
200					
1000					
1100					
1000					
420					
		19/6 13 April			
332					
100					
500					
100					
20					
302					
89261					
(Signature)					
(State whether Manager or Secretary)					

\*The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout so as to make one

total to agree with that stated in the Summary to have been taken up.

†When the Shares are of different classes these columns may be subdivided so that the number of each class held, or transferred, may be shown separately.

‡The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed

opposite the name of the Transferor, and not opposite that of the Transferee, but the name of the Transferee may be inserted in the "Remarks"

column immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison & Swan  
Company Limited, on the tenth day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Ledger, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
	<u>Fully Paid</u>			
	61 Agnew	J. H.	5 Mount. Manchester	Com. Agent.
	65 Alexander	J.	2 St. Helens Place E. C.	Agent.
	69 Armitage	B.	Chomlea. Pundleton	do
	73 Armitage	E.	The Rookery, Pundleton	do
	77 Armitage	J.	Charley Field, Pundleton	do
	81 Armitage	L.	Charley House, Pundleton	do
	85 Ashley	H.	6 Knighton Villa, Buckhurst Hill.	do
	89 Ashby	L.	do do	do
	93 Barrett	H.	3 Knowlstock Sq. W.C.	do
	97 Benson	R. H.	4 Bishopsgate St. E. C.	do
	101 Birchall	J. D.	Bowden Hall, Gloucester.	do
	105 Birkbeck	R.	20 Berkeley Sq. W.	do.

NOTE.—This margin reserved for binding, and must not be written across.

United Electric

1886, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES						REMARKS
*Number of Shares held by existing Members at date of Return†	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members		‡Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members			
	Number†	Date of Registration of Transfer	Number‡	Date of Registration of Transfer		
93						
25						
16						
16						
16						
90						
5						
5						
2						
25						
25						
50						
368.						
(Signature)						
(State whether Manager or Secretary)						

NOTE.—This margin reserved for binding, and must not be written across.

\*The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout so as to make one total to agree with that stated in the Summary to have been taken up.  
<sup>1</sup>When the Shares are of different classes these columns may be subdivided so that the number of each class held, or transferred, may be shown separately.  
<sup>2</sup>The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferor, and not opposite that of the Transferee, but the name of the Transferee may be inserted in the "Remarks" column immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison & Swan United  
Company Limited, on the 10th day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Lodger, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
109.	Black.	G.	21 Broughley St. W.	Policeman
113.	Blumenthal	J.	65 Nya Park Gate S. W.	Leut.
117.	Brumby	Wm. E. P.	144. Nelson Crescent W.	King's Commissioner
121	Brumwell	St. F. J.	5 St. George St. S. W.	Engineer
125.	Carte	Wm. R.	Parry Theatre W. C.	Leut.
129.	Cogswell	H.	52. Theatrical St. E. C.	do.
133.	Chadwick	S.	17. Parliament St. S. W.	do.
137.	Crawson.	St.	Alderley Edge.	Merchant.
141	Cross.	E.	Bradford St. Bolton.	Bottom Spinner.
145.	Douglas.	J.	22 Old Broad St. E. C.	Leut.
149.	Dummett	J.	54. Porchester Terrace W.	do
153.	Ferguson	R.	Radcliff Ho. St. Ruyfel	do

NOTE.—This margin is reserved for binding, and must not be written across.

Electric Light  
1886, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES						REMARKS
*Number of Shares held by existing Members at date of Return†	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members		‡Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members			
	Number†	Date of Registration of Transfer	Number†	Date of Registration of Transfer		
868.						
13.						
25						
125						
63						
25						
25						
18						
50						
62						
305						
50						
5						
11/31	(Signature) (State whether Manager or Secretary)					

NOTE.—This margin is reserved for binding, and must not be written across.

\*The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout so as to make one total in agree with that stated in the Summary to have been taken up.  
†When the Shares are of different classes these columns may be sub-divided so that the number of each class held, or transferred, may be shown separately.  
‡The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferee may be inserted in the "Remarks" column immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison & Swan United  
Company Limited, on the last day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Leger, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
107.	Heming	J. A.	13 Albert Mansions S.W.	
161.	Fowler		38 Grosvenor Sq. W.	
✓ 165.	Frankland	E.	16 Juss. Rungate	P. F. W.
169.	Firth & Co.		West Hill, Putney	Genl.
170.	Sadban	P.	42 Old Broad St. E. C. 6.	do
177.	Elliot	H.	4 Grosby St. E. C. 6.	Merchant
181.	Goldsmit	Sr. J.	105. Piccadilly. W.	Baronet
185.	Grant	G. S.	Argyle St. Glasgow	Agent.
✓ 189.	Hamker	R. A.	7. Mincing Lane. E. C. 6.	Genl.
✓ 193.	Harding	W. A.	50 Gros Lane, Lambeth	do
197.	Harris	L. A.	Kirkby Longdale.	do
201.	Hemmerle	J.	26. Chagmorton St. E. C. 6.	do

NOTE.—This margin is reserved for binding, and must not be written across.

Electric Light

1886, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES					REMARKS
Number of Shares held by existing Members at date of Return†	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members		†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members		
	Number†	Date of Registration of Transfer	Number†	Date of Registration of Transfer	
1131					
2					
38					
30.					
25					
62					
7					
50					
125.					
1					
13					
33					
50					
16					
1540					

(Signature)\_\_\_\_\_

(State whether Manager or Secretary)\_\_\_\_\_

(Signature)

(State whether Manager or Secretary)

\*The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout so as to make one total in agree with that stated in the Summary to have been taken up.  
†When the Shares are of different classes these columns may be sub-divided so that the number of each class held, or transferred, may be shown separately.  
‡The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferee may be inserted in the "Remarks" column immediately opposite the particulars of each Transfer.



List of Persons holding Shares in the Edison & Swan United  
Company Limited, on the fourth day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Lodger, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
205.	Agnew	E.	Springfield, Blackburn	Cent.
209.	Aspkinson	J.	4. Westminster Chambers S. W.	D. S.
213.	Ascar	S.	1. Harford Lane. W.	Banker.
217.	Jackson	R. R.	11 Queen Victoria St. E. C.	Cent.
221.	Lander	W. W.	26. Thagmorton St. E. C.	do.
225.	Liddasab	W.	2. Lenchurch Ave. E. C.	do.
229.	Lubback	S. J.	15. Lombard St. E. C.	Banker.
233.	Lubback	W. G.	15. Lombard St. E. C.	Banker.
237.	Melloe	J. P.	Bevirity France	Cent.
241.	Moore	H. H.	6. Lombard St. E. C.	Merchant.
245.	Parter	P.	White Knight, Reading	Cent.
249.	Prie	S. L.	44. Gresham St. E. C.	Chartered Acc.

NOTE.—This margin is reserved for binding, and must not be written across.

Electric Light

1886, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES					REMARKS
*Number of Shares held by existing Members at date of Return†	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members	Number†	Date of Registration of Transfer	
540					
38					
50					
37					
50					
12					
25					
125					
12					
25					
50					
50					
42					
2056					
(Signature) _____					
(State whether Manager or Secretary) _____					

\*The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout so as to make one  
total to agree with that stated in the Summary in here been taken up.  
†When the Shares are of different classes there columns may be sub-divided so that the number of each class held, or transferred, may be shown separately.  
‡The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed  
opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferee may be inserted in the "Remarks"  
column immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison & Swan Light  
Company Limited, on the tenth day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Ledges, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
283.	Pryor.		12. St. Winchester St. E. C.	Merchant.
284.	Rathbone	S. W.	21 Water St. Liverpool.	Cart.
281.	Rathbone.	J. F. S.	do.	do.
✓ 265.	Rathbone	W.	Greenbank, Liverpool.	do.
269.	Rathbone	W. G.	2 Finchurch W. E. C.	do.
273.	Reed.	E. P. S.	9. Drapers Gardens, E. C.	do.
277.	Rennie.	W.	16 Leadenhall St. E. C.	do.
281.	Robinson.	S. G.	Flat. Prov. Bank, Rotherhithe E. C.	do.
285.	Scoble.	A. R.	21 Kensington Grove Terrace. W. 20	do.
✓ 289.	Scott.	L. R.	9. Drapers Gardens. E. C.	do.
293.	Stewart	E. J.	4. Adams Court. E. C.	do.
297.	Stewart	J.	Flat. Prov. Bank. E. C.	do.

NOTE.—This margin is reserved for binding, and must not be written across.

Electric Light  
1886, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES					
*Number of Shares held by existing Members at date of Return	Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members		Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members		REMARKS
	Number	Date of Registration of Transfer	Number	Date of Registration of Transfer	
20 56					
24.					
4.					
25.					
25.					
18.					
10					
25.					
5					
25.					
12					
12					
77.					
2326.					
(Signature) _____					
(State whether Manager or Secretary)					

\*The aggregate Number of Shares held, and not the Distributive Members, must be stated, and the column must be added up throughout so as to make one total to agree with that stated in the Summary to have been taken up.  
†When the Shares are of different classes there columns may be sub-divided so that the number of each class held, or transferred, may be shown separately.  
‡The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferee may be inserted in the "Remarks" column immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison & Swan United  
Company Limited, on the fourth day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Ledger, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
301.	Shaw	E. W.	101 Regado Southwark	Genl.
305.	Stone	E. W.	9 W. Mildreda Court E. C.	do.
309.	Thomson	Sa. W.	10 University Glasgow.	do.
313.	Tipping	W.	Brasted Park, Sevenoaks	do.
317.	Wade	E. L.	18 Old Broad St. E. C.	do.
321	Wade	R. B.	13 Seymour St. W.	do.
325.	Waltham	W.	Parley Grange, Wincfield	do.
329	Waterhouse	A.	25 New Cavendish St. W.	Architect
333.	Waterhouse	E.	44. Graham St. E. C.	Accountant
337.	Waterhouse	J. E.	Elderley Edge.	Merchant
341.	Waterhouse	P.	1 New Court. W. C.	Genl.
345.	Watson	W. C.	4 W. Winchester St. E. C.	do.

NOTE.—This margin is reserved for binding, and must not be written across.

Shaw & Light

1886, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES						REMARKS
*Number of Shares held by existing Members at date of Return†	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members	Number†	Date of Registration of Transfer	Number†	
2326						
13						
50						
38						
66						
25						
62						
25						
125						
125						
137						
125						
52						
3169						
(Signature)						
(State whether Manager or Secretary)						

(Signature)

(State whether Manager or Secretary)

\*The aggregate Number of Shares held, and not the Distributive Numbers, must be stated, and the column must be added up throughout so as to make one total to agree with that stated in the Summary to have been taken up.  
†When the Shares are of different classes these columns may be subdivided so that the number of each class held, or transferred, may be shown separately.  
‡The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferee, but the name of the Transferee may be inserted in the "Remarks" column immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison & Swan United  
Company Limited, on the twelfth day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Ledger, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
349.	White	A. H.	Newnham Club, S.W.	Cent.
353.	White	F. G.	Bromwell Rd. S.W.	do.
357.	Winkbottom		17 New Court. D.C.	Director
361.	Edwards	J. W.	26. Queen St. New York.	do.
365.	Starrs	P. P.	1 Broadway, New York.	do.
369.	Harjes	J. H.	31 B <sup>2</sup> . Haussmann Paris	do.
373.	Lewis	H.	238. Chestnut St. Philadelphia.	do.
377.	Freibold	J. S.	30. Walnut St. do.	do.
381.	Lilliat	A.	4. Brodwy St. S. C.	do.
385.	Hammer	W. J.	65. Fifth Avenue, New York.	do.
389.	Mosley	C.	Victoria Park, W. photo	do.
393.	Penell	W. H.	19. George St. W. photo	do.

NOTE—This margin is reserved for binding, and must not be written across.

Electric Light  
1884, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES					
*Number of Shares held by existing Members at date of Return	Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members		Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members		
	Number	Date of Registration of Transfer	Number	Date of Registration of Transfer	REMARKS
3164.					
24.					
42					
12					
125					
120					
250					
31					
31					
50					
5					
125					
12					
4001					
			(Signature)		
			(State whether Manager or Secretary)		

(Signature)

(State whether Manager or Secretary)

\*The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the columns must be added up throughout so as to make one  
unit to agree with that stated in the Summary to have been taken up.  
\*When the Shares are of different classes these columns may be subdivided so that the number of each class held, or transferred, may be shown separately.  
\*The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed  
opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferee may be inserted in the "Remarks"  
columns immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison & Swanwick  
Company Limited, on the 10th day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
347.	Smith.	E. J.		Genl.
401.	Williamson	J. Y.	30 Frank St. Philadelphia	do.
405.	Whitcomb			do.
409.	Kendall.	H. J. B.	Union Bank, Prince St. E. 6.	do.
413.	Barclay.	G.	112. Rindbergsale St. E. 6.	do.
417.	Anderson.	W.	60 Courtfield Gdns. S. W.	do.
421.	Webster.	G. E.	Spencer Square S. W.	Colonel R. E.
425.	Cross.	J. K.	Fernside, Bolton.	Genl.
429.	Brand.	J.	33. Old Broad St. E. 6.	do.
433.	The Pennsylvania		Co. for Insurances on Lives and Banking of America, Philadelphia & S. C.	
437.	Bresal	A. J.	Philadelphia, N. S. C.	Genl.
441.	Thomas.	G. G.	Philadelphia E. S. C.	do.

NOTE.—This margin is reserved for binding, and must not be written across.

Platina Light

1881, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES					REMARKS
*Number of Shares held by existing Members at date of Return†	Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members	Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members			
Number†	Date of Registration of Transfer	Number†	Date of Registration of Transfer		
4001					
25					
63					
12					
19					
24					
25					
2					
50					
31					
77					
155					
3					
4492					
(Signature)					
(State whether Manager or Secretary)					

NOTE.—This margin is reserved for binding, and must not be written across.

(Signature)

(State whether Manager or Secretary)

\*The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout as to make one total to agree with that stated in the Summary in here been taken up.  
†When the Shares are of different classes these columns may be subdivided so that the number of each class held, or transferred, may be shown separately. The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferor may be inserted in the "Remarks" column immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Illinois & Wisconsin  
Company Limited, on the twelfth day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Ledger, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
445.	Loafney	C. H.	New York. N. S. Y.	Genl.
449.	Stollenberg	E. S.	Philadelphia N. S. Y.	do.
453.	Paul	J. M. Junr.	Philadelphia N. S. Y.	do.
✓ 457.	Wright	J. H.	New York. N. S. Y.	do.
✓ 461.	Amson	Marion	5. Canville N. W.	do.
103.	Bidwell	J.	Remond's Lodge, Mendot	do.
705.	Ligland	F. R.	49. Princeton St. S. W.	do.
717.	Lubbock	Ed. J.	15. Lombard St. S. E.	Banker.
717.	Forbes	J. S.	6 Chelsea Embankment S. E.	Genl.
✓ 719.	Batt	E. W.	20. St. Wm. St. S. E.	do.
723.	Vibliers	E.	5. Beech St. S. W.	First-Genl.
725.	Greene	F.	6 Old Jury. S. E.	Genl.
727.	Swanwick	Charles L. Co. for	13 Albert Mansions S. W.	

NOTE—This margin is reserved for binding, and must not be written across.

Price Two-Pence. Form No. 8a.

Electric Light

1886, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES					
*Number of Shares held by existing Members at date of Return	†Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members		‡Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members		REMARKS
	Number	Date of Registration of Transfer	Number	Date of Registration of Transfer	
449					
26					
10					
10					
37					
125					
125					
175					
747					
200					
200					
200					
1					
11535					
17139					

(Signature)

(State whether Manager or Secretary)

\*The aggregate Number of Shares held, and not the Distinctive Numbers, must be stated, and the column must be added up throughout so as to make one  
total to agree with that stated in the Summary to have been taken up.  
†When the Shares are of different classes these columns may be subdivided so that the number of each class held, or transferred, may be shown separately.  
‡The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed  
opposite the name of the Transferee, and not opposite that of the Transferor, but the name of the Transferor may be inserted in the "Remarks"  
column immediately opposite the particulars of each Transfer.

List of Persons holding Shares in the Edison & Swan United  
Company Limited, on the last day of August  
the date of the last Return, or (in the case of the first Return) of the  
Account of the Shares so held.

Folio in Register Ledgers, containing Particulars	NAMES, ADDRESSES, AND OCCUPATIONS			
	Surname	Christian Name	Address	Occupation
<u>13. Shares.</u>				
803.	Mered	A. J.	Philadelphia U. S. A.	Cent.
804.	Thomas	G. C.	Philadelphia. U. S. A.	do.
809.	Edison	L. A.	New York.	do.
811.	Loafey	G. H.	New York.	do.
813.	Johnson	E. H.	New York.	do.
815.	Stokesbury	E. L.	Philadelphia U. S. A.	do.
817.	Batchelor	E.	New York.	do.
819.	Paul	J. M. Junr.	Philadelphia U. S. A.	do.
821.	Upston	F. R.	New York.	do.
823.	Wright	J. H.	New York.	do.
825.	Douglas	J.	22 Old Broad St. S. C.	do.
827.	The Pennsylvania Co.	etc.	Philadelphia U. S. A.	do.
829.	Samson	W. F.	New York	Cent.

NOTE.—This margin is reserved for binding, and must not be written across.

Sharia Light  
1888, and of Persons who have held Shares therein at any time since  
incorporation of the Company, showing their Names and Addresses, and an

ACCOUNT OF SHARES					
*Number of Shares held by existing Members at date of Return†	†Particulars of Shares Transferred since the date of the Return, or (in the case of the first Return) of the incorporation of the Company, by persons who are still Members		‡Particulars of Shares Transferred since the date of the last Return, or (in the case of the first Return) of the incorporation of the Company, by persons who have ceased to be members		REMARKS
	Number†	Date of Registration of Transfer	Number‡	Date of Registration of Transfer	
	1281				
	26				
	9038				
	224				
	1178				
	79				
	1063				
	79				
	532				
	1023				
	5550				
	655				
	2835				
	23564				

(Signature) S. Wood Page Secretary  
(State whether Manager or Secretary) 13<sup>th</sup> Aug 1886

\*The aggregate Number of Shares held, and not the Effective Numbers, must be stated, and the column must be added up throughout so as to make one  
unit to agree with that stated in the Summary to have been shown up.  
†When the Shares are of different classes these columns may be subdivided so that the number of each class held, or transferred, may be shown separately.  
‡The date of Registration of each Transfer should be given as well as the Number of Shares transferred on each date. The Particulars should be placed  
opposite the name of the Transferee, not opposite that of the Transferor, but the name of the Transferee may be inserted in the "Remarks"  
column immediately opposite the particulars of each Transfer.

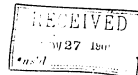
**Edison Ore Milling Company, Ltd. Minute Book**

This minute book covers the years 1879-1900 and contains material relating to the Edison Ore Milling Company, Ltd. This company was organized in 1879 to exploit Edison's ore milling patents in the United States and abroad. Included with the minutes are agreements, by-laws, resolutions, and articles of incorporation. There are also letters and reports by Sherburne B. Eaton and other company officials regarding Edison's ore milling experiments and company finances. Attached to the first page is a letter of November 27, 1901 from Walter S. Mallory, vice-president of the company, to Alexander Elliott, Jr., Edison's legal counselor, stating that the information contained in this volume would be used as evidence in a dispute with the state of New York regarding taxes assessed against the company. The book is unpaginated. Approximately 300 pages have been used.



Edison Ore Milling Co.  
Minutes of

HKO  
JD



November 27th, 1901.

Judge Elliott:-

I am very anxious to get the following information at the earliest possible moment, so to make an affidavit to go to Albany, in relation to the taxes assessed against the Ore Milling Company. Will you, therefore get the records and minute book from Mr. Randolph and get for me the following information:

First: Amount of the original capital stock; date the Company was organized; the amount of the capital stock paid to Mr. Edison and for what it was paid.

Second: Date the capital stock was increased; why it was increased and what additional stock was paid to Mr. Edison, and why. (My recollection is that it covered cash he had advanced.)

Third: Patents: My recollection is that all patents have been taken out in the name of Mr. Edison, but that the original agreement specified that when the Edison Ore Milling Co. had done certain things and made certain payments, Mr. Edison was to assign the patents to the Company. The Company, however, not carrying out this part of the agreement, the patents have never been assigned, and always have stood in the name of Mr. Edison.

Also, that about two years ago, a new agreement was executed by him and all rights the Ore Milling Company had to the patents, were given up and the titles remain in Mr. Edison, consideration for this being the amount of money paid to Mr. Edison at that time. Please give me this amount.

Yours very truly,

*W. A. Walling*

The original certificate, of which the following is a copy, was filed in the Office of the Secretary of State of the State of New York, at Albany, on the 11<sup>th</sup> day of December, A. D. 1879.

State of New York

City & County of New York } ss

We, Thomas A. Edison, a citizen and resident of Monticello Park in the State of New York; James H. Bramson, a citizen and resident of Binghamton in the State of New York; Robert L. Girdling, junior, a citizen and resident of the City and State of New York; Gustavus P. Lowrey, a citizen and resident of Mount Pleasant in the County of Westchester and State of New York; and Charles H. Peters, a citizen and resident of Brook-

ly in the State of New York: We hereby certify that we propose to form a corporation under the provisions of an Act of the Legislature of the State of New York entitled "An Act to provide for the organization and regulation of certain business corporations," passed June 21. 1875, and the Acts amendatory thereto and amended along thereof; such corporation to be of the class of limited liability companies provided for by the thirty third section of said Act of June 21. 1875; and, accordingly, in pursuance of the provisions aforesaid, we do further certify as follows, to wit:

First. The name of the proposed corporation is to be

The Edison Ore-Milling Company, Limited  
Second. The objects of the proposed corporation and the nature of its business are to be respectively the acquiring and using processes and inventions for extracting metals from ores by electricity and other means and better Patent of the United States and other countries for such of them as may be patentable; the selling of interests or rights under said better patent, and the granting of licenses to use such processes and inventions; the building and owning mills for extracting metals from ores, either on the Company's own account or on hire for others; the buying of ore and the selling of the metals extracted from them; and the doing such other business as is incidental to the objects and business aforesaid.

And the locality of the business of the proposed corporation is to be chiefly at the City of New York in the State of New York, but also in such other places or countries as may be necessary for effecting the objects aforesaid.

Third. The capital stock of the proposed corporation is to be

three hundred and fifty thousand dollars —

Fourth. The number of shares of which such capital stock shall consist is to be three thousand and five hundred, of the par value of one hundred dollars each.

Fifth. The location of the principal business office of the proposed corporation is to be in the City of New York in the State of New York.

Sixth. The duration of the proposed corporation is to be twenty five years from the date of its incorporation.

In Witness whereof we have hereunto set our hands, at the City of New York the ninth day of December in the year 1879

Thomas A. Edison  
James H. Barker  
R. L. Walling Jr  
Charles H. Brown  
G. P. Sawyer

State of New York

City & County of New York } ss - On this 9<sup>th</sup> day of December in the year 1879, before me personally came Thomas A. Edison and Charles H. Barker to me severally, personally known and known to me to be the same persons deputed in and who executed the foregoing instrument, and they avowedly acknowledged to me that they executed the foregoing instrument and for the purposes therein mentioned. And the said Charles H. Barker being by me duly sworn, did depose and say that at the time of signing the foregoing certificate he was and now is a citizen and resident of the State of New York.

Chas. Roth (ss)

Notary Public N.Y.C.

State of New York.

City & County of New York. } ss. On this 11<sup>th</sup> day of December in the year 1879, before me personally came Robert L. Cutting, James H. Banks and Governor J. Severy, to me severally personally known and known to me to be the same persons described in and who executed the foregoing instrument, and they severally acknowledged to me that they executed the foregoing instrument and for the purposes therein mentioned, and the said Robert L. Cutting, James H. Banks and Governor J. Severy being by me severally duly sworn, did each for himself depose and say that at the time of signing the foregoing certificate he was and now is a citizen and resident of the State of New York.

Chas. Keith (ss)

(LS)

Notary Public N.Y.C.

And therefore and on said 11<sup>th</sup> day of December 1879 the Secretary of State issued a license to the parties making such certificate - in the following form, to wit:

613

License

State of New York

Office of the Secretary of State. ss

Whereas, an application for the formation of

a corporation in the class of Limited Liability, under the corporate name of "The Edison Arc Lighting Company, Limited," pursuant to the provisions of Chapter 111, Laws of 1878, entitled "An Act to provide for the organization and regulation of certain business corporations," was filed in this office on the eleventh day of December A.D. 1879.

I therefore License and Appoint Thomas A. Edison, James H. Banks, R. L. Cutting jr, J. P. Severy and Charles H. Town Commissioners to open lock for subscriptions to the capital stock of such corporation, agreeably to the requirements of the said act.

Witness my hand and the seal of Office of the Secretary of State, at the City of Albany, this eleventh day of December. 1879

(LS)

Geo. Allen

Secretary of State

And in virtue and by authority of said License and agreeably to the requirements of the Act therein referred to, the said Commissioners have opened this lock for subscriptions to the Capital Stock of "The Edison Arc Lighting Company, Limited" on this twenty ninth day of December. 1879 at

# List of Subscribers

We, the undersigned, hereby subscribe for the number of shares of the Capital Stock of The Edison Ore-Milling Company, Limited, which are set opposite our respective names

Names	Residences	Number of Shares
James H. Gibson	Livingston N. Y.	400
Robt. Livingston Jr.	New York City	400
Charles Lewis	Brooklyn N.Y.	800 shares
James H. Gibson	Livingston N. Y.	50 shares
Robt. Livingston Jr.	New York City	50 shares
Charles P. Lewis	Brooklyn N.Y.	50 "
William H. McKean	Rahway N.J.	5 Shares
Frank McLaughlin	Newark N.J.	5 shares
Wm. L. Coffin	Newark N.J.	5 shares
W. L. Perry	New York City	20 "
W. L. Coffin	do	5 shares
W. L. Coffin	"	5 shares

And we, the commissioners above named, hereby certify that, at the time of making their respective subscriptions above named, each of the said subscribers paid to us, the commissioners, in cash, ten per cent. of the par value of each share subscribed for by him

On the said 29<sup>th</sup> day of December, 1879, it appearing that at least one half of the capital stock of The Edison Ore-Milling Company, Limited, had been duly subscribed, the said Commissioners called a meeting of the said subscribers for the purpose of adopting by-laws for said corporation and of electing directors thereof

Such meeting was called by depositing a notice in the Post Office in the City of New York addressed to each and every subscriber at his last known place of residence and with the proper postage thereon prepaid, at least five days previous to the date appointed for said meeting, which notice was in the form set forth on the receipt report hereinafter appearing.

At the time and place named in said notice, to wit: on the fifth day of January A. D. 1880, at 11:19 William Street in the City of New York, at eleven o'clock in the forenoon, subscribers to the number of eight and representing, moreover,

seventeen hundred and ninety shares of the capital stock, appeared and engaged by choosing Mr. James H. Banker and Mr. Albert L. Colling, junior, Chairman, and Secretary, respectively.

On motion it was

Resolved That the following are hereby adopted as the by laws of the corporation

#### By-Laws

- 9 -

#### The Eastern Ore Mining Company Limited

#### Limited

adopted at a meeting of the subscribers to the stock held in the City of New York on the fifth day of January in the year 1880

#### Article 1. Directors

Section 1. The property and business of the Company shall be managed, and its affairs shall be regulated by a board of nine directors.

Section 2. The term of office of the Directors shall be one year.

Section 3. When any vacancy shall occur among the directors by death, resignation or otherwise, it shall be filled for the remainder of the year by a vote of a majority of the remaining directors.

Section 4. The directors shall hold regular quarterly meetings on the third Mondays of December, March, June, and September in each year.

Section 5. Special meetings of the directors may be called by the President at his discretion; and shall be called by him, to be

held three days after written request to that effect delivered to him, setting forth the object of the proposed meeting, and signed by any two directors; and notice of such meeting and of each object thereof shall be delivered to each director, or sent to his address by mail, in either case two days before the time of the proposed meeting.

Section 6. The directors shall have power to appoint such agents and other employees of the Company as they shall deem necessary, and provide their duties.

Section 7. The directors shall designate three of their number as an Executive and Finance Committee, which Committee shall have and exercise the powers of the directors in the intervals between their meetings.

Section 8. The following shall be the order of business at the meeting of the directors: roll call; reading of minutes; reports of officers; reports of committee; unfinished business; new business.

#### Article 2. Executive and Finance Committee.

Section 1. Regular meetings of the Executive and Finance Committee shall be held on the second Monday of each month in each year; and special meetings may be called at any other time by the President, or by either member of the Committee, on giving ten days notice, personally, or by mailing such notice to each member of the Committee.

Section 2. Two members of the Committee, together with the President shall be a quorum for the transaction of business.

Section 3. The Committee shall keep minutes of all its proceedings, which shall be read from time to time at the next following meetings of the Board of Directors.

Article 3. Auditing Committee

At each regular quarterly meeting of the Board of Directors, they shall appoint one or more of their number a Committee to examine the stock book accounts, vouchers and records of the Company and to report the result thereof to the directors at their next regular quarterly meeting.

Article 4. Stockholders

Section 1. The annual meeting of the Stockholders shall be held at noon of the third Tuesday of January in each year at the office of the Company in the City of New York.

Section 2. At each annual meeting of the stockholders the Board of Directors shall make a report of the business, prospects and affairs of the Company for the preceding year, an election of nine directors shall be made by ballot, and such other business shall be transacted as the stockholders shall deem necessary.

Section 3. Two inspectors of election shall be appointed at each annual meeting in such manner as such meeting shall designate, who shall be sworn to examine as required by law, and shall examine and count the votes and shall certify in writing to the meeting the names of the persons elected directors.

Section 4. At the annual meeting the polls shall be kept open one hour unless the votes are received sooner.

Section 5. Special meetings of the stockholders may be called by order of the President in his discretion, and shall be called by him, to be held within fifteen days, upon a written request in that behalf made, signed either by a majority of the trustees or by stockholders owning one third in interest of the Capital stock of the Company, and written or printed notice of such special meeting stating

the object of it shall be sent to each stockholder whose address can be learned by the Secretary ten days before the day of the meeting.

Section 6. Two thirds in interest of the stockholders shall attend either in person or by proxy at every meeting to constitute a quorum.

Article 5. Officers

Section 1. The officers of the Company shall be a President, Vice President, Secretary and Treasurer.

Section 2. The directors shall meet for the election of such officers, and for the transaction of business, without unnecessary delay, after the annual election.

Section 3. The President and Vice President shall be elected separately by ballot by the Directors from among their number, and the persons receiving the vote of a majority of the Directors of the Company shall be elected and be such officers respectively.

Section 4. The Secretary and Treasurer may be appointed by a vote of a majority of the Directors.

Section 5. The salaries of the officers shall be fixed by the Directors.

Section 6. The President shall be the chief executive officer of the Company, he shall preside at all meetings of the directors, and of the Executive and Finance Committee, he shall sign all certificates of stock, and all contracts on behalf of the Company; he shall cause to be assigned all checks drawn by the Treasurer, and shall perform such other duties as are incidental to his office. He shall be, ex officio, a member of the Executive and Finance Committee, and he shall prepare a report for the annual meeting of the stockholders, which shall be submitted to the directors for their approval.

Section 7. The Vice President, during the absence or inability of the President, shall preside at the meetings of the Directors.

and of the Executive and Finance Committee, and shall in all other respects possess and exercise the powers and perform the duties of the President.

Section 8. The Secretary shall give notice of all meetings and shall keep the minutes of the proceedings of the meetings of the stockholders and of the directors and of the Executive and Finance Committee. He shall have charge of the stock books and shall countersign all certificates of stock and be responsible for the correct issuing and cancellation of the same; he shall keep the corporate seal, and when authorized by the directors shall affix the same to contracts, and shall perform such other duties as the directors may prescribe. At the annual meeting of the stockholders he shall submit a full statement of the business of the Company for the preceding year.

Section 9. The Treasurer shall receive and have charge of all funds of the Company; he shall deposit the same to the credit of the Company in such bank as the directors shall designate; and he shall declare the same only under their direction; he shall give bond in the sum of twenty five hundred dollars, with two sufficient sureties, being freeholders within the County of New York, for the faithful discharge of his duties. He shall sign all checks for the payment of money, which shall also be countersigned by the President or Vice President. He shall keep regular books of account, showing all his receipts and disbursements and all the business of the Company, which shall be at all times open to inspection of any director of the Company, and he shall report the condition of the Treasury at each regular meeting of the Board of Directors; and at the annual meeting he shall make

a report in writing to the President, showing the financial condition of the Company.

Section 10. When any vacancy shall occur among the officers of the Company by death, resignation or otherwise, it shall be filled in the same way as is provided in this article for the election and appointment of such officers.

#### Article 6. Stock and Certificates of Stock.

Section 1. The subscriptions to the stock of the Company shall be paid to the Company, in installments of one tenth thereof at the time of subscription and the rest at or before the expiration of six months thereafter.

Section 2. On failure to pay when due any installment of the sum subscribed for stock of the Company, the stock so subscribed shall be forfeited together with all prior payments made on account of the subscription thereof.

Section 3. Certificates of stock in the form required by law shall be numbered and bound in books, and when issued shall be registered for in the margin, and no certificate shall be signed or issued in blank.

Section 4. No transfer of stock shall be valid unless made on the books of the Company on surrender of the old certificate, which shall be cancelled and posted by the secretary in the book at the place where it was issued.

Section 5. The stock transfer books may be closed by order of the directors for the purpose of declaring a dividend or for holding an annual election, but for no longer term than twenty days at one time.

#### Article 7. Corporate Seal.

The corporate seal of the Company shall bear its corporate name.



in a circle around the books.

### Article 3

Whenever on three days previous to vote for giving either their personal votes to officers and stockholders or others, such votes shall be sufficient of and in writing by mail, addressed to such person at their last known place of residence.

### Article 4. En-Laws

These En-Laws may be allowed, amended, repealed or new En-Laws may be added at any regular meeting of the directors by a vote of a majority of all the directors, provided written notice of the specific alteration, amendment, repeal or addition proposed to be made, has been given at a previous regular meeting of the Board, or such alteration, amendment, repeal or addition may be made at a special meeting of the directors of which such written notice as above mentioned has been given or sent to each director at least thirty days before such special meeting.

The meeting then proceeded to the election of new directors

The Chairman appointed Messrs George Howard, & H. Howard, and W. H. Cutting inspectors of such election

And upon a canvass by such inspectors it was found that eight votes representing seventeen hundred and seventy shares of the capital stock had been cast, of which each of the following persons received eight votes viz James H. Benson, Charles H. Town, Robert L. Cutting, James T. Miller, W. H. Parker, Frank W. Livingston, Stockton L. Griffin, W. L. Perry, R. L. Cutting and Geo. W. Town being all the votes cast.

whereupon said persons were declared duly elected, and a certificate of said inspectors to that effect was thereupon made by them in writing.

On the eighth day of January, 1876, a verified record of the proceedings of said Commissioners having been filed in the office of the Secretary of State containing proof of meeting of the directors of the meeting aforesaid, and also a copy of the subscription list to the capital stock together with a copy of the foregoing En-Laws adopted by the subscribers to the capital stock and certificates of the inspectors of the election aforesaid, as more fully hereinafter set forth - the Secretary of State did thereupon deliver to the Company a certificate in the following form.

### State of New York

#### Office of the Secretary of State

It is hereby certified that an original certificate for the formation of a corporation in the class of limited liability corporations, under the corporate name of The Edison Oil-Mining Company, limited, was filed in the office of the Secretary of State, under Chapter 611 Laws of 1875, entitled "An Act to provide for the organization and regulation of certain business corporations," on the 11<sup>th</sup> day of December, 1879, and that the following is a true and correct copy of said original certificate (the same having been compared with said original) and of the whole thereof.

### State of New York

#### City & County of New York

55

The Thomas A. Edison, a citizen and resident of New York in

the State of New Jersey, James H. Banker, a citizen and resident of Burlington in the State of New York, Robert L. Greeting, junior, a citizen and resident of the City and State of New York, Grover J. Lewis, a citizen and resident of Mount Pleasant in the County of Rochester and State of New York, and Charles H. Lewis, a citizen and resident of Brooklyn in the State of New York, do hereby certify that we propose to form a corporation under the provisions of an Act of the Legislature of the State of New York, entitled "An Act to provide for the organization and regulation of certain business corporations," passed June 21, 1875, and the acts add thereto and amendments thereof, such corporation to be of the class of limited liability companies provided by the thirty third section of said Act of June 21, 1875 and accordingly, in pursuance of the provisions aforesaid, we do further certify as follows, to wit:

First. The name of the proposed corporation is to be

"The Edison Arc Lighting Company, Limited."

Second. The objects of the proposed corporation and the nature of its business are to be respectively the acquiring and using processes and inventions for extracting metal from ores by electricity and other means and Letters Patent of the United States and other Countries for such of them as may be patentable; the selling of interests or rights under said Letters Patent and the granting of licenses to use such processes and inventions; the building and owning mills for extracting metals from ores either on the Company's own account or on hire for others; the buying of ores and the selling of the metals extracted from them; and the doing such other business as is incidental to the

objects and business aforesaid.

Third. The locality of the business of the proposed corporation is to be chiefly at the City of New York in the State of New York, but also in such other places or countries as may be necessary for effecting the objects aforesaid.

Fourth. The capital stock of the proposed corporation is to be three hundred and fifty thousand dollars.

Fifth. The number of shares of which such capital stock shall consist is to be Three thousand and five hundred, of the par value of one hundred dollars each.

Sixth. The location of the principal business office of the proposed corporation is to be in the City of New York in the State of New York.

Seventh. The duration of the proposed corporation is to be twenty five years from the date of its incorporation.

In Witness whereof we have hereunto set our hands at the City of New York the Ninth day of December in the year 1877

Thomas A. Edison  
James H. Banker  
R. L. Greeting Jr.  
Charles H. Lewis  
G. J. Lewis

State of New York

City & County of New York } ss - On this 9<sup>th</sup> day of December in the year 1877, before me personally came Thomas A. Edison and Charles H. Lewis, to me severally personally known and known to me to be the same persons directed in and who executed the foregoing instrument, and they severally acknowledged to me that they executed the foregoing

instrument and for the purposes therein mentioned. And the said Charles H. Jones being by me duly sworn, did depose and say that at the time of signing the foregoing certificate he was and now is a citizen and resident of the State of New York.

(L.S.)

Chas. H. H. (31)

Notary Public  
N.Y.C.

State of New York }  
City & County of New York. } ss. On this 16<sup>th</sup> day of December with-  
was 1879, before me, personally, came Robert L. Cutting, senior,  
James H. Banker and Clarence P. Leroy, to me severally, personally  
known and known to me to be the same persons described in and  
who executed the foregoing instrument, and they severally acknowledged  
to me that they executed the foregoing instrument and for the purposes  
therein mentioned. And the said Robert L. Cutting, junior, James H.  
Banker and Clarence P. Leroy, being by me severally duly sworn, did  
each for himself depose and say that at the time of signing the  
foregoing certificate he was and now is a citizen and resident of the  
State of New York.

(L.S.)

Chas. H. H. (32)

Notary Public  
N.Y.C.

And it is further hereby certified. That upon the filing of said  
certificates of which the foregoing is a true and correct copy, on the  
eleventh day of December, 1879, as aforesaid, a license was issued  
by the Secretary of State, pursuant to said Act, to the five persons  
named in and who made and acknowledged said certificate.

empowering them, as Commissioners, to draw checks for subscriptions to  
the capital stock of said proposed corporation, at such times and  
places as they might determine.

And a verified record of the proceedings of said Commissioners,  
having this type date of January, 1880, been filed in the office of the  
Secretary of State, containing a copy of the subscription list to the  
capital stock of said proposed corporation, together with a copy of  
the by-laws for and proposed corporation, adopted by the subscribers  
to and capital stock at a meeting of said subscribers, held at  
S. & W. Nelsons Street in the City of New York, on the eighth day  
of January, 1880, pursuant to the provisions of said Act, in ap-  
pearance for and verified record aforesaid, at which subscribers  
meeting as aforesaid, were declared (being the minutes provided for  
in the said to laws of said proposed corporation), were also chosen,  
whose names, as further appears from said verified record of pro-  
ceedings filed as aforesaid are as follows, to-wit:

James H. Banker  
Robert L. Cutting, Jr.  
Charles H. Jones  
William M. Maher  
Frank A. H. Langdon  
Stephen L. Griffin  
W. J. Perry  
R. L. Cutting  
Geo. W. Jones

Said George F. Jones & Wood, Dep. Secretary of State  
do hereby certify that said corporation, to-wit: The Edison Ore  
Refining Company Limited, is fully organized in accordance with

said Act, Chapter 60, law of 1878, and that all the business of said Act have been duly observed in the organization of said corporation, as hereinafter set forth.

Whereas we have and the seal of office of the Secretary of State, at the City of Albany this twelfth day of January 1880

Witness our hand and seal  
Record of Incorporation

Given by Me  
Sefely Secretary of State

And said corporation having been duly recorded in the office of the Secretary of State, on the twelfth day of January 1880 a copy thereof was also filed and recorded as required by law in the office of the Clerk of the City and County of New York, in Book of Incorporations Vol. 8 2 at page 19, that being the County in which the principal office of said Company is situated.

The receipt report also referred to, filed in the office of the Secretary of State on the 5<sup>th</sup> day of January 1880 was in the following form

#### Commissioners' Report

Receipt Record of Records  
(See Section 2, Chapter 60, Laws of 1878)

State of New York

City and County of New York

Be, the undersigned, duly appointed and empowered by the Secretary of State of the State of New York, by license bearing dated on the eleventh day of December A.D. 1879, Commissioners to open books for subscriptions to the capital stock of a limited liability company to be

known under the corporate name of The Edison & Wallace Company, Limited, have report in conformity therewith

That on the twenty-ninth day of December, A.D. 1879, at the office of Robert F. Walling, Jr. & Co., at 8 12 Wallman Street, in the City of New York, we opened books for subscriptions to the capital stock of said company.

That a correct note is a true copy of the list of subscriptions to the said capital stock, which list is marked "Exhibit A," and is hereby made a part of this record.

That at the time of making such subscriptions, each stockholder paid to us in cash ten percent of the par value of each and every share subscribed for by him.

That on the twenty-ninth day of December, A.D. 1879, it appearing that at least one-half of the capital stock of the said "The Edison & Wallace Company, Limited" had been duly subscribed in accordance with the requirements of Section 5 of the aforesaid Act, we called a meeting of the subscribers for the purpose of adopting by laws for said corporation, and of electing directors thereof.

That such meeting was called by depositing a notice in the Post Office, addressed to each and every subscriber at his last known place of residence, and with the proper postage thereon prepaid, at least five days previous to the time specified for said meeting, as appears in the copy of said notice, and the accompanying official minute annexed, marked "Exhibit B," and which is hereby made a part of this record.

That at the time and place named in said notice, to wit: on the fifth day of January A.D. 1880, at 8 12 Wallman Street, in the City

of New York, at eleven o'clock in the forenoon, subscribers to the minutes of said stock, and representing said stock, hundred and seventy shares of the Capital stock, appeared and organized by choosing Mr. James H. Banker and W. Robert Cutting, junior, Chairman, and Secretary, respectively.

That we, under, at one o'clock, but the following are hereby attested as the By-Laws of this corporation.

(Then follow the By-Laws)

That the meeting then proceeded to the election of new directors. That the same amounted to Messrs George Howard, C. H. Howard and W. L. Cutting, inspectors of said election.

That upon a canvass by each inspector it was found that eight of the representing, seventeen hundred and seventy shares of the Capital stock, had been cast, of which

James H. Banker of Burlington, New York, received said eight votes  
Robert L. Cutting, jr. of New York City, New York, received said eight votes  
Charles H. Keene, of Brooklyn, New York, received said eight votes  
William W. Barber of Rahway, New Jersey, received said eight votes  
Francis M. Sawright of Newark, New Jersey, received said eight votes  
Nathan L. Griffin of Atlantic City, New Jersey, received said eight votes  
W. L. Perry of New York City, New York, received said eight votes  
W. L. Cutting, of New York City, New York, received said eight votes  
Geo. F. Davis, of New York City, New York, received said eight votes

Being all the vote cast, whereupon they were declared duly elected, as appears by the certificates of the Inspectors herewith annexed, marked Exhibit C, and which is hereby made part of this record.

That there being no further business, the meeting then

adjourned.

W. L. Cutting, Jr.  
Secretary

And we, the Commissioners aforesaid, being severally duly sworn, depose and say, and each for himself depose and say, that the foregoing is a true and correct record of the proceedings had under the aforesaid license and of all of them from the time of the receipt thereof.

Subscribed and sworn to before me this fifth day of January, 1880  
by James H. Banker, W. L. Cutting, Jr.,  
Charles H. Keene, and G. F. Davis  
Chas. K. B. (25)

W. L. Perry  
New York County

James H. Banker  
W. L. Cutting, Jr.  
Charles H. Keene  
G. F. Davis  
Thomas A. Edison

State of New Jersey  
County of Middlebury } ss.

I, Thomas A. Edison, one of the Commissioners aforesaid, being duly sworn, depose and say that the foregoing is a true and correct record of the proceedings had under the aforesaid license and of all of them from the time of the receipt thereof.  
Subscribed and sworn to before me  
this 5<sup>th</sup> day of January, 1880

Nathan L. Griffin  
Notary Public

Thomas A. Edison

Exhibit A referred to in the foregoing Report

List of Subscribers to the capital stock of  
The Edison Ore Milling Company, Limited

<u>Name</u>	<u>Residence</u>	<u>N<sup>o</sup> of shares</u>
James H. Barker	Bronxton N.Y.	400
H. L. Cutting, Jr.	New York City	400
Charles H. Lewis	Brockton N.Y.	800
James H. Barker	Bronxton N.Y.	50
H. L. Cutting, Jr.	New York City	20
Charles H. Lewis	Brockton N.Y.	100
William H. Baker	Rahway N.J.	5
Frank W. Loughlin	Newark N.J.	5
Stephen L. Griffin	Newark N.J.	5
W. S. Terry	New York City	20
H. L. Cutting, Jr.	New York City	5
Geo. W. Town	New York City	5

Exhibit B referred to in the foregoing Report.

New York, December 29<sup>th</sup> 1879

Notar

At a meeting of the subscribers to the capital stock  
of The Edison Ore Milling Company, Limited, will be held

at the office of H. L. Cutting, Jr. and Company at No 19  
William Street in the City of New York, on Monday, January  
3<sup>rd</sup> 1880, at eleven o'clock in the forenoon for the purpose of  
adopting by laws for said corporation and electing directors thereof

Thomas A. Edison  
James H. Barker  
H. L. Cutting, Jr.  
G. K. Lewis  
Charles H. Lewis  
Commissioners

State of New York

City and County of New York

James Jordan, being duly sworn, deposes and says that  
he is upwards of sixteen years of age; that on the 29<sup>th</sup> day of  
December, 1879, he deposited in the Post Office in the City of New  
York nine written copies of the above notice, each notice having been  
first carefully enclosed in an envelope, and said envelopes having  
been respectively addressed to James H. Barker, Bronxton, New York,  
H. L. Cutting, Jr. New York City; Charles H. Lewis, Brockton, New  
York; William H. Baker, Rahway, New Jersey; Frank W. Loughlin,  
21 Colder Street, Newark, New Jersey; Stephen L. Griffin, Newark, New  
Jersey; W. S. Terry, New York City; H. L. Cutting, New York City;  
and Geo. W. Town, New York City; said persons being severally  
the subscribers to the capital stock of The Edison Ore Milling  
Company, Limited, and the places above named being  
their respective last known places of residence, and  
the proper postage on each of said envelopes having  
been prepaid by deposant before the mailing thereof

as represented

Sworn to before me this

30<sup>th</sup> day of December, 1879

Chas. Roth (2:1)

John W. Little

N.Y.C.

Francis Jordan

Exhibit C referred to in the foregoing Report

State of New York

City and County of New York

We, George Howard, C. H. Howard and W. L. Cutting, the  
Inspectors for the first annual election of The Edison Electric  
Company, limited, being severally duly sworn, do depose and  
say and each for himself deposes and says

That at each election held at the office of Robert L.  
Cutting, Jr. & Company, N. 19 William Street, in the City of  
New York, on the 5<sup>th</sup> day of January, A.D. 1880, the following  
named stockholders were elected Directors, each Director having  
received the number of votes set opposite to his name, to wit:

James H. Banker

received eight votes

Charles H. Lewis

received eight votes

R. L. Cutting Jr.

received eight votes

William H. Parker

received eight votes

Frank H. Laughlin

received eight votes

Stephen L. Griffin

received eight votes

W. L. Perry

received eight votes

R. L. Cutting

received eight votes

Geo. W. Brown

received eight votes

Sworn to before me this

5<sup>th</sup> day of January 1880

Chas. Roth (2:1)

John W. Little

N.Y.C.

Geo. Howard

Charles H. Howard

W. L. Cutting

Inspector's

State of New Jersey

Department of State

I, Henry C. Kelley, Secretary of State of the State of  
New Jersey, do hereby certify that Stephen L. Griffin, Esquire,  
whose signature is affixed to the affidavit attached to the  
paper hereto annexed, was, at the date thereof, Acting Notary  
in and for the State of New Jersey, duly elected, commissioned  
and sworn according to law, as appears by the official  
records of this Department, and is duly authorized to ad-  
minister oaths and full faith and credit ought to be given  
to his acts and attestations done in that capacity, and that  
his signature thereto is genuine, as I verily believe.

In testimony whereof, I have hereunto set my  
(seal) hand and affixed my official seal, at Trenton,  
this sixth day of January A.D. 1880.

Henry C. Kelley.

Secretary of State

State of New Jersey

I, George B. S. Clifton, Governor of the State of New Jersey do hereby certify that Henry C. Hobbs, Esquire, who hath signed the annexed certificate, and whose official seal is thereto annexed, was at the doing thereof, and now is, Secretary of State of the State of New Jersey, duly appointed, commissioned, and sworn, and that full faith and credit are to be given to his official attestation; that the said certificate is in the proper handwriting of the said Henry C. Hobbs, and the said seal set of office, and that the said certificate is in due form of law, and by the proper officers.

(and) In testimony whereof, I have hereunto set my hand, and caused the Great Seal of the State of New Jersey to be hereunto affixed, at the City of Trenton, in said State, this sixth day of January in the year of our Lord one thousand eight hundred and eighty, and of the Independence of the United States the one hundred and fourth.

Geo B S Clifton.

By the Governor

Henry C. Hobbs,

Secretary of State.

Secretary of the meeting

In pursuance to a call dated Jan'y 9<sup>th</sup> 1880 for a meeting of the directors of the Edison Electric Lighting Company, said meeting was held at the office of the Company No 14 William Street New York Tuesday January 13<sup>th</sup> 1880. There being present James H Banks - Chas H Lewis Robert L Cutting Jr Frank M.ughlin D. L. Griffin Wm McMahon N. Perry H L Cutting and Geo W Corson. The meeting was called to order by Mr. D. L. Cutting Jr. D. L. Griffin was made Secretary of the meeting. On motion of Mr. Banks that the Board proceed to the election of officers James H Banks was nominated for President and Chas H Lewis for Vice President. The Board then proceeded to ballot for the officers of President and Vice President. James H Banks was unanimously declared President and Charles H Lewis was unanimously declared Vice President. Robert L Cutting Jr being nominated for Treasurer was unanimously elected to hold office during the pleasure of the Board. D. L. Griffin was then nominated for Secretary and unanimously elected to hold office during the pleasure of the Board. The President then appointed Chas H Lewis and Robert L Cutting Jr. Executive and Finance Committee. Thomas A Edison was then nominated to



fill the office of Electrician and Consulting Engineer, and unanimously decided to fill the same at a salary to be hereafter determined.

A motion was then made and carried that Frank M. Knight be made superintendent to hold office at the pleasure of the Board at a salary to be hereafter determined.

Mr. W. S. Perry then tendered his resignation as director which on motion of Mr. R. L. Cutting Jr. was accepted and Thomas A. Edison was elected a director to fill the vacancy.

R. L. Cutting Jr. then offered a resolution as follows which was duly seconded.

Whereas the following amount of stock has been subscribed by the following parties who have also paid in 10% of the par value of their subscription it is hereby resolved that they be released from the payment of the 90% still due and allowed to take full paid stock to the amount of their subscriptions paid in (10% in as per list.

James H. Barker	400	Shares
R. L. Cutting Jr.	400	"
Chas H Lewis	800	"
James H. Barker	50	"
R. L. Cutting Jr.	50	"
Chas H Lewis	50	"

Wm McMalon	5	Shares
Frank McLaughlin	5	"
Stockton J. Griffin	5	"
W. S. Perry	20	"
R. L. Cutting	5	"
Geo W. Soren	5	"

And that upon their releasing to the Company their several interests in the stock subscribed for by them above the 10% already paid thereon that full paid shares to the amount of such payment be issued to them respectively.

(On motion duly made and seconded it was unanimously resolved, That 2850 shares of full paid stock of the Company be paid and issued to Thomas A. Edison in consideration of his conveyance and transfer to the Company of all his inventions processes and patents already or hereafter made or acquired within 5 years and patents in or relating to the Milling of ores by Electricity or otherwise and of an agreement on his part for services in respect thereto and of his assignment to the Company of all his interest in certain contracts for ore or tailings hereto for made by him and it is further resolved that the execution of the terms of this resolution be and is hereby referred to Robert L. Cutting Jr.

and Geo W Doorn with power. Carried.  
Resolved: That the Executive and Finance  
Committee have power, to sell the 500  
Shares of the Stock of the Company, now in  
its treasury at not less than par  
and in such amounts from time to  
time as they shall require.

The treasurer then reported the  
following list of sales of the Stock  
of the Company to wit:

Sales	Shares	Rate	Amount
J. J. Hage	1	250	1000
Carl Parker	1	250	250
G. E. Russell	1	250	250
Hunting Bros	13	150	1950
H. R. Miller	10	100	1000
C. B. Wheeler	12	150	1800
J. B. Weaver	30	100	3000
W. L. Culling	30	100	3000
W. S. Perry	20	100	2000
J. Steward	20	100	2000
M. E. Connor	10	100	1000
Bull	10	100	1000
Lynch	25	100	2500
W. Culling	20	125	2500
Kiddie, P. &	11	250	2750
(W. S. Perry Rogers & DeGruene)	2	250	500
Edw. Jackson	1	250	250
	220		26750

Resolved: That the Shares reported as sold  
by Mr. Culling be delivered to the  
Subscribers on payment into the Treasury  
of the amounts subscribed by them. Carried.  
Resolved: That the Treasurer be authorized  
to pay to Mr. Frank M. Laughlin such sum  
of money not exceeding \$5000 as may from  
time to time be required for the uses of  
the Company and upon approval thereof  
by Mr. Edison Electrician and Consulting  
Engineer of the Company.

Resolved: That the Farmers Loan and Trust  
Company be and it is hereby designated  
as the depository of the funds of the Company  
and also as the transfer agent and registrar  
of the Stock.

No further business being brought  
before the meeting a motion to adjourn  
being made was carried.

Attest

Secretary

New York Jan'y 10, 1880

At the annual meeting of the stockholders of the Edison Coal Milling Co held this day at the Company's office 19 William St. N.Y. A. L. Cutting in the chair, the following gentlemen were elected directors for the ensuing year.

James H. Barker	A. L. Cutting
Thos A. Edison	J. McLaughlin
A. L. Cutting Jr	S. H. Griffin
C. H. Lewis	E. W. Jones
H. B. Perry	

The No. 1 vote cast was 1416 - The meeting then adj'd until 1 P.M. Jan'y 22<sup>d</sup>.

N.Y. Jan'y 22, 1880

At a meeting of the Directors of the Edison Coal Milling Co held this day at the office of the Co 19 W. St. it was moved & seconded that the meeting be called for President & Vice Pres. James H. Barker & C. H. Lewis having no proxies were elected Pres & Vice Pres. It was then moved & seconded that A. L. Cutting Jr be appointed treasurer to hold office during the pleasure of the board.

It was also moved & seconded that S. H. Griffin be appointed Secy to hold office during the pleasure of the board.

It was then moved & seconded that C. H. Lewis, A. L. Cutting Jr & S. H. Griffin should act as finance <sup>& audit</sup> committee. A draft of a contract between T. A. Edison & the Co's Milling Co was read by Mr. Jones after which the meeting adjourned.

The Annual meeting of the Edison Inc. Melling Company, Limited, was held on the 18<sup>th</sup> day of January 1884 at the Companies Office, 3<sup>rd</sup> 19 William Street in the City of New York.

The meeting organized by choosing James H. Rankin, Chairman, and Herbert L. Cuffin, Secretary.

On motion Ezra E. Chilton and Carter H. Howard were appointed inspectors of the election of directors this to be held and they were duly sworn according to law.

On motion it was resolved that the books remain open for one hour, namely from 12 o'clock noon to 1 o'clock.

The President, on behalf of the Directors, then made to the meeting a report of the condition of the Company, as follows:

The capital stock of said Company is Three hundred and fifty thousand dollars (\$350,000).

The whole of said capital has been paid in full by cash, notes, letters patent, contracts and other property actually received for the use and legitimate purposes of said Company at its full value.

The existing assets of the Company consist of cash to about fifteen thousand eight hundred and thirty six dollars (\$15,836.00) and of letters patent and contracts of the value of at least three hundred and fifty thousand dollars (\$350,000).

The existing debts of the Company do not exceed two hundred and fifty dollars (\$250.00) for labor and services.

The polls being closed at one o'clock, the inspectors reported in writing to the meeting, which report was ordered on file.

It appeared from the report that there were present at the meeting, in person or by proxy, holders of "twenty four hundred and sixty two shares of the capital stock of the Company; that there were twenty four hundred and sixty two votes cast, and six of them for the following persons as directors, viz:

Messrs. H. Edison, Jas. H. Rankin, R. L. Cuffin, Jr., C. H. Howard, J. H. Perry, R. L. Cuffing, Walter L. Cuffing, & L. Griffin and Donald W. Loughlin - and they were thereupon declared, duly elected, directors of the Company for the ensuing year.

On motion the meeting adjourned.  
(The Secretary of the meeting was directed to notify the newly elected directors of their election and to call a meeting of them for the 2<sup>nd</sup> of June at 2 P.M., which was accordingly done - notices being sent by mail.)

S. L. Griffin  
Secy. of the Meeting

#### Copy of Report of Inspectors of Election of Jan'y 18, 1884

Messrs. E. Chilton and Carter H. Howard, appointed Inspectors of the election of Directors, held at the annual meeting of the Edison Inc. Melling Company, Limited, hereby report that having first taken and subscribed the oath, both affirmed, we entered upon the duties of our office as such Inspectors as aforesaid; that on the closing of the polls we canvassed and counted the votes cast; and

that there were present at each meeting, in pursuance to proxy, holders of "seventy four hundred and sixty two shares of the capital stock of the Company, that there were cast at each election, seventy four hundred and sixty two votes and that all of them were cast for the following named persons for Directors for the ensuing year, namely: Theo. A. Edison, Jas. H. Barker, E. L. Cutting Jr., C. H. Deane, W. L. Ferry, E. L. Cutting, M. L. Coffin, J. L. Griffen, Frank M. Langdon.

Signed:

James S. Chittum

Charles E. Howard

Secretary of Election Jan 24/81

(The oath referred to above is annexed to and forms part of original report on file etc.)

W. J. Jan'y 24 1881

At a meeting of the Board of Directors of the Edison One Milling Company Limited, held at the office of the Company 349 William Street, at 2 PM Jan'y 24 1881, were present Messrs Barker, E. L. Cutting Jr., W. L. Ferry, E. L. Cutting, M. L. Coffin, J. L. Griffen.

On motion, duly seconded the meeting proceeded, to select for President and Vice President.

M. J. H. Barker having received 5 votes was elected duly elected President.

M. L. Edison having received 5 votes was elected duly elected Vice President.

On motion M. L. E. Cutting Jr. was appointed Treasurer and M. L. Griffen Secretary, to hold office during the pleasure of the Board.

On motion Messrs E. L. Cutting, E. L. Cutting Jr. and W. L. Ferry were appointed an Executive and Finance Committee.

On motion a resolution was adopted requesting M. J. H. Edison, as Electioneer, to report to the Board what he has already accomplished and what he proposes doing during the coming year.

On motion, adjourned.

New York 16<sup>th</sup> April 1881

At a special meeting of the Board of Directors of the Edison & Williamson & Co. limited the following resolutions of the Company No 17 William St. at New York 16<sup>th</sup> April 1881 were proposed  
 Resolved That Messrs. Edison & Williamson & Co. be dissolved.  
 Resolved That the business of the Company be carried on by the Board of Directors.

Griffiths resignation accepted

It was moved & seconded that Mr. Griffiths resignation as Director & Secretary be accepted. Carried

W. L. Perry appointed Secretary

It was moved that Mr. Perry be appointed Secretary to hold office during the pleasure of the Board. Carried

An motion affirmed subject to call of the Chairman

W. L. Perry  
 Secretary

New York, June 27<sup>th</sup>, 1881

At a meeting of the Board of Directors of The Edison & Williamson & Co. limited, held at No. 65 Fifth Avenue, N.Y. City this day.

Present Messrs. Baileys,

Edison,

R. L. Guthing,

W. R. Guthing,

R. L. Guthing Jr.

W. L. Perry

On motion it was voted that the Board present to fill the vacancy created in the Board of Directors by the resignation of L. L. Griffiths. Carried

J. B. Eaton  
 Vice President

Mr. J. B. Eaton was then unanimously elected a Director of the Company.

J. B. Eaton  
 appointed  
 General Manager

It was then moved, seconded and unanimously carried that Mr. J. B. Eaton be appointed General Manager of the Company, and that in consideration of his services for one year from date, the Company hereby gives him an option for one year on as hundred and fifty shares of the Treasury Stock of the Company at par.

Mr. Eaton, upon invitation, then entered the meeting, and upon being informed of the foregoing resolutions of the Board, accepted the position of Director and of General Manager on the same

as stated above.

Major Eaton's report. Mr. Eaton then made a report of his inspection of the operations of the Magnetics Mining Company on the sea shore near Quogue, Long Island, and he stated that the Magnetics Company is desirous of making a contract with this Company for the further and permanent use of its patents.

It was then moved, seconded and carried, that the subject of such contract with the Magnetics Mining Company and all matters therewith connected, be referred to a special committee consisting of Messrs. Edison and Eaton with full power to act.

It was then moved, seconded and carried that the permanent office of this Company be hereafter at No. 65 Fifth Avenue.

The meeting then adjourned.

Attest

W. L. Perry  
Secretary.

New York June 13<sup>th</sup> 1881.

Minutes of the regular monthly meeting of the Executive and Finance Committee of The Edison Gas Mining Company, Limited, held at the above date at the office of the Company No. 65 Fifth Avenue, New York City.

Present Messrs R. L. Guthrie  
R. L. Guthrie, Jr. and  
W. L. Perry, also  
J. B. Eaton, General Manager.

Mr. Eaton stated that he had expected to submit to the Executive Committee a proposition from the Magnetics Mining Company for the use of the patent machinery at Quogue, Long Island, but that up to this time the expected proposition had not been received.

Question of  
using machine  
at California

The question of sending a machine to California at an early day to be there used by Major M. Langhorne was then discussed, and Mr. Edison, who at this stage of the meeting occupied the room, stated that he would at once dispatch a machine to be used in California.

Reports of  
this Committee  
press.

Mr. Eaton then made reports of progress in searching for sand, made by Mr. Stone at Orville's Vineyard, and Mr. Chaseman on the coast of Rhode Island between Point Judith and Watch Hill. Mr. Edison stated that Mr. Chaseman had

nearest Quebec and best discount rate deposits in that neighbourhood.

The Committee then adjourned to meet on Friday, June 17<sup>th</sup> at the same hour and place as the present meeting.

Attest

W. L. Perry  
Secretary

New York June 17<sup>th</sup>, 1881.

Minutes of a meeting of the Executive Committee of the Edison  
Gro. Mining Company, Limited, held at the office of the  
Company No 65 N.Y. Ave. at 3.30 p.m. June 17<sup>th</sup>, 1881.

Present Messrs I. A. Edison.

R. L. Gilling,

R. L. Gilling, Jr.

and S. B. Eaton, General Manager.

Proposed contract  
with Magnetite  
Iron Co. discussed.

The proposed contract with the Magnetite Iron Co. was  
discussed. Mr. Eaton stated he was informed that that  
Company was to be organized with a capital of \$500,000  
divided into 50,000 shares of \$10 each; that 10,000 shares

were to be sold at five dollars each, that is to say, at 50  
cents on the dollar in order to realize \$50,000 for the treasury,  
that out of that treasury fund \$30,000 was to be paid to  
the Magnetite Mining Company, together with 20,000 shares  
of fully paid stock, the same to be paid to that Company  
in exchange for its lease and personal property; that the  
remaining 20,000 shares of stock, together with \$20,000 in  
money was to remain in the treasury of the Magnetite Iron  
Company.

Terms of  
proposed  
contract.

On motion, Mr. Eaton was instructed to make and execute  
a contract with the Magnetite Iron Company on the following  
general terms, to wit:

- I. Ten per centum of stock fully paid.
- II. Thirty cents royalty on each ton of magnetite mined,  
after the separation.
- III. The Magnetite Co. to advance half the price of the  
machines.

The meeting then adjourned.

Attest

W. L. Perry  
Secretary



New York June 26<sup>th</sup>, 1881

Minutes of the meeting of the Directors of the Edison Co.  
Mining Co. Limited, held at the office of the Company, No  
65 Fifth Avenue at half past three p.m. June 26<sup>th</sup>, 1881.

Present Messrs Banker,

R. L. Guthrie,

W. R. Guthrie,

W. S. Ferry,

S. B. Eaton and

Frank M. Laughlin.

Mr. Banker, Pres. in the chair.

The minutes of the meetings of July 24<sup>th</sup>, April 16<sup>th</sup>,  
June 2, June 13 and June 17, were read and approved.

Major M. Laughlin  
present as he sending  
machines to California.

The President called upon Major M. Laughlin to state  
his views with regard to sending a machine to California.  
Major M. Laughlin states that he had examined one of the  
machines at the George H. Works, and thought it was not  
adapted to working the gold workings of the Mexican Mines.  
He requested that, at least for the present, no machine be  
sent to him.

Ferry resigns as  
member of the Com.

Mr. W. S. Ferry tendered in his resignation as member  
of the Executive Committee. Mr. S. B. Eaton was elected member

of the Executive Committee in place of Mr. Ferry.

The meeting then adjourned to Friday, June 27<sup>th</sup>, at  
same hour and place.

Attest

W. S. Ferry  
Secretary

New York June 27<sup>th</sup>, 1881

Minutes of a meeting of the Directors of the Edison Co.  
Mining Co. Limited held at the office of the Company, No 65  
Fifth Avenue at 3.30 p.m. this day.

No quorum being present the meeting was adjourned.

Attest

W. S. Ferry  
Secretary

New York July 11, 1881

Regular monthly meeting of the Executive & Finance Committee of  
the Edison Co. Mining Co. Limited held at the office of the  
Company this day.

No quorum being present the meeting was adjourned

Attest

W. S. Ferry  
Secretary

New York Aug. 8, 1881

Regular monthly meeting of the Executive & Finance Committee of the Edison Ore Mining Co. Limited held this day at the offices of the Company.

No quorum being present the meeting was adjourned.

Attest

W. P. Perry  
Secretary.

New York Sept. 12, 1881

Regular monthly meeting of the Executive & Finance Committee of the Edison Ore Mining Co. Limited, held this day at the offices of the Company.

Present

James H. Baulton  
Robert L. Guthrie  
Walter L. Guthrie  
Robert L. Guthrie Jr. and  
S. B. Eaton.

Minutes of four previous meetings read and approved.

Mr. Eaton reported that 7 1/2 of a miles of beach near Westbury, R. I. viz: Desnoochung Beach, had been leased for 3 years and that operations had just been commenced, and that as soon as matters had developed a little further a paper

contract should be made with this Company.

Mr. Eaton also reported that the sands at Moineo on the Gulf of the St. Lawrence had been carefully inspected by a party sent from here and a full report prepared.

There being no other business on hand the meeting was adjourned.

Attest

W. P. Perry  
Secretary.

New York Oct. 10, 1881

Minutes of the regular meeting of the Executive Committee of the Edison Ore Mining Co. Limited held at its offices, No 65 Fifth Ave. October 10, 1881:

No quorum being present the meeting was adjourned.

Attest

W. P. Perry  
Secretary

New York Oct. 28, 1881

Minutes of a special meeting of the Directors of the Edison Ore Mining Co. Limited, held at No 65 Fifth Avenue, at 3.30 p.m. October 28, 1881.

Present Messrs Baulton, R. L. Guthrie, S. B. Eaton, W. L. Perry, Frank W. Langhain and S. B. Eaton.

Mr. Eaton read the following report as to location

prospects for magnetite iron sand and as to other matters pertinent to the business of the Company.

"Report of J. B. Falar, General Manager, to the Directors of the Edison Ore Mining Company, Limited, as to locations prospects for Magnetite Iron Sand and as to other matters pertaining to the business of the Company.

—Continued:

On the 26<sup>th</sup> of May last I visited Quebec, L. I. for the purpose of inspecting the workings of Mr. Edison's ore separator there on behalf of this Company and on my return made a report to you of the result of my observations. The result of such operations was so satisfactory that it was decided to at once send out several parties to different locations for the purpose of prospecting for magnetite iron sand, with a view to securing such territory as might be found rich enough to pay for working.

Three men were then sent out, viz: William Chapman, to explore the region of Lake Ontario; W. A. Stone, to the islands in the neighborhood of and including Manhattan Island; and W. H. Chapman to prospect the coast of Connecticut and Rhode Island.

On June 23<sup>rd</sup>, after an absence of over two weeks, Mr. Stone reported that he had searched on the islands of Manhattan Island, Randolts, Rockland, Manhattan and Randolts, but had not found magnetite iron to any extent. He found some at a place called Matamoras on the south shore of Manhattan Island, but the quantity of iron was only from 5 to 10 per cent, not enough to make it pay to send a separator and machinery to work. He reported that at the other places he had visited

there was merely the slightest traces of iron to be detected in the sand.

Mr. Chapman reported on the 1<sup>st</sup> of July, that he had examined the shores of Lake Ontario from Sackett Harbor to Toronto, but had found only some isolated spots bearing magnetite iron sand and in these places the per centage was only about 8 per cent.

Mr. Chapman reported on June 20<sup>th</sup>, that he had examined Fisher's Island and part of the Rhode Island coast and that there was about 1 1/2 miles of sand at Quonamontang Beach, R. I. which it would pay to secure, that sand bearing on average of 25 per cent of magnetite iron.

After consultation with Mr. Edison and others of the Directors, I instructed Mr. Chapman to secure a lease of such beach, if possible, for the purpose of working same. After some effort he succeeded in securing a lease of 3/4 of a mile of that beach for three years at \$25 a year. The lease was taken in the name of R. L. Cutting Jr., Trustee.

Machinery has been taken down to Quonamontang Beach and the process of separating the iron from the sand is being regularly carried on, Mr. Chapman being Superintendent.

The buildings, consisting of a wooden shed 24 x 16 x 15 feet and an open shed over the dryer 30 x 10 feet, were commenced about August 26<sup>th</sup>, and a separator, dynamo and small Barker engine were sent down from the Quonamontang ship some afterwards. There was some delay in getting up the iron drying pan on account of the lack of labor in the neighborhood - and, as nothing could be done until the dryer was in operation, it was not until nearly the middle of September that work was commenced. The

The dryer broke down; the cross supports not having been strong enough. This caused another delay of a week; it being impossible to obtain a means for upwards of four days. After this it was found that the pulley of the elevator which carries the sand into the hopper was not the right size, and this was a delay of a few days more.

It might seem that this last break-down could have been avoided, but I am satisfied that we have done better than we could have done under ordinary circumstances and with ordinary workmen. It so happens that Mr. Chasman has been in the grain elevator business in the West and so knows all about elevators. The machinist, too, whom he employs at Duunontung to run the engine, was engaged with him in that business; consequently we had the advantage of their knowledge and experience in building this elevator, which is quite one thing in the working of sugarbeet sands, as a labor saving device.

This separator at Duunontung is separating from 7 to 8 tons of sand a day. The only drawback is the lack of facilities for shipping. The beach is situated some miles outside of Long Island Sound and fronts on the ocean. There being no harbor, Captains of schooners will not anchor unless there is a N.W. wind blowing; thus we cannot be as regular in shipments as if there were a harbor or dock.

We have, after a great deal of difficulty, succeeded in making a market for the separated sand. Iron manufacturers generally do not seem to think it can be worked, but it is well known to a few that the working of such fine ore is

practicable. We have found at least a customer, namely, the Tongsheppar Iron & Steel Co., Tongsheppar, N. Y. to whom I shipped a sample ton at their request. I was much gratified at the fact that three days after they received the sample, their agent called and asked to have 75 tons forwarded to that Company under the usual dispatch. Orders to that effect were immediately given to Mr. Chasman, who at once engaged a vessel. This was a small vessel, but was the only one he could get on a week and the freight which was asked was higher than I expect to pay later, namely, \$2.75 per ton from Duunontung to Tongsheppar. The vessel anchored off the beach two days ago, October 26<sup>th</sup>, and received a cargo of 56 tons and is now on her way to, or arrived at, Tongsheppar. The above Company now want to make a contract to take all our product, not exceeding 100 tons per week at \$10 a ton - which I now submit to you.

The representatives of the Tongsheppar Company, at their request, paid a visit to Duunontung on Wednesday of this week and was very much pleased with our progress there.

Mr. Chasman reports that the two horse power engine which he has there is not sufficient, and that when it is in a fit condition to be changed for another and larger one it should be done. He thinks that with a larger boiler and engine he could use waste steam for drying the sand instead of burning wood, also separate more iron and do better work generally. The present dryer is also in need of repair. There will have to be two or three new plates and some stronger supports. It will also be advisable to build two additional wings to the shed

so that sand can be stirred up for working in very bad weather. With these improvements and additions, work can be continued, I believe, no through the winter with much success.

The ups and downs we have had in the working of this beach at Duoncontung will be an almost inevitable experience to this Company and to others using its machines, as I think we have now found out where the weak spots are and could at any new place go to work almost without a hitch of any kind.

The representative of the Pugetharpes Company mentioned that he knew a party who would pay us 50 cents per bar for our tailings, he to go to the beach and take them away. As they will in the future be very much in our way it might be well to accept this offer.

During the summer of this year a piece of property of 9000 acres, situated at Meade in the Gulf of the St. Lawrence, was offered to us. I sent Mr. Edmunds to inspect the same, and he made a lengthy report which showed that the deposit at Meade was of a large extent. The owner of this property, however, wanted \$20,000. in cash for it, which I did not feel authorized to pay, and after consideration we decided to reject this offer. They have now sold it to other parties at that price and have offered to pay Mr. Edmunds the expenses of visiting Meade to investigate the property.

A large number of persons have made inquiries lately regarding the terms of sale for our separators. Several of these persons wish to use the machines in California. Others, among whom is the Thresh Bros. Irons of Brewster's Station, N. Y. and the Ogden Magnetic Iron Mining Company, wish to run pulverized magnetic ore through our separator. Experiments have been tried with this pulverized ore, but it is too fine and clogs up the mouth of the hopper. Mr. Edison will shortly make some improvement in the hopper to meet the exigency and we can then probably dispose of several machines.

We are now prepared to supply separators and to instruct parties in the use of them, and I am now corresponding with a number of persons on this subject.

Respectfully,

L. C. Eaton.

General Manager.

New York, October 30<sup>th</sup> 1881.

Mr. Eaton also submitted a memorandum of his cash disbursements for the Company to date, as follows:

For general expenses of the Company . . . 464. 93

For money expended in account of the }  
separation of sand at Duoncontung, R. I. } 1921. 83

Total \$2386. 76

On motion it was unanimously resolved that the Treasurer of the Company be directed to reimburse to Mr. Eaton, as General Manager, his disbursements for the sums above set forth; and

further that the Treasurer be authorized to advance, unless further advised by the Board or the Executive Committee, such further sums of money from time to time on the approval of said Board or General Manager, as may be necessary for carrying on the experiments at Hammondbury Beach; and further that the General Manager turn over to the Treasurer of this Company whatever moneys may be received on account of iron sold from said beach whenever any such moneys may be received by him.

Mr. Nelson then submitted the question as to whether the Company should enter into a proposed contract to sell its iron delivered at Poughkeepsie, N. Y. at ten dollars per ton for a fixed period. The unanimous decision was that no permanent contract or agreement should be made but that the Company should be left free to obtain the best market they could.

The question of price to be charged customers for ore separators for iron sand and metallic ores was then discussed.

The following resolution was unanimously adopted:

Resolved, That unless further advised the price of the Ore Separator for separating metallic ores be fixed on, the basis of a cost of \$500, or not less than \$1000, that is to say, a profit of one hundred per centum, together with a royalty of fifty cents per ton of 2000 pounds of the separated ore. Also that when machines are sold it be

only with the provision that they shall be used for no other purposes than those mentioned in the contract, and shall not be used outside of a given locality which shall also be set forth in the contract of purchase.

The meeting then adjourned.

Attest

W. P. Perry  
Secretary.

New York November 14, 1881.

Minutes of the regular monthly meeting of the Executive Committee of the Edison Ore Mining Company, Limited, held at the office of the Company November 14, 1881, at 3.30 P. M.

No quorum appearing, the meeting was adjourned.

Attest

W. P. Perry  
Secretary.

New York December 12, 1881.

Minutes of the regular monthly meeting of the Executive Committee of the Edison Ore Mining Company, Limited, held at the office of the Company, December 12, 1881, at 3.30 P. M.

No quorum appearing, the meeting was adjourned.

Attest

W. P. Perry  
Secretary.

New-York Jan'y 9. 1882.

The regular monthly meeting of the executive Committee of The Edison Ore Milling Company, Limited, was held at the office of the Company this day.

A quorum appearing the meeting adjourned.

Attest

*W. Perry*  
Secretary.

State of New York,  
City of New York.

Office of The Daily Graphic.

THE EDISON ORE MILLING COMPANY  
INCORPORATED IN THE STATE OF NEW YORK  
THE STATE OF NEW YORK, I, JAMES J. CONNELLEY, Clerk of the Court of Sessions for the County of New York, do hereby certify that the foregoing is a true and correct copy of the minutes of the meeting of the executive committee of the Edison Ore Milling Company, Limited, held at the office of the Company, in the City of New York, on the 9th day of January, 1882, as the same appears from the minutes of said meeting, and remains on file in the office of the Clerk of the Court of Sessions for the County of New York, in the City of New York, in accordance with the provisions of the laws of this State relating to the filing of minutes of meetings of corporations.

F. D. BUNCE, of the City of New York, being duly sworn, says that he is the proprietor of THE DAILY GRAPHIC, a daily newspaper published in New York City, and that the copy of which the annexed is a copy, has been published in said THE DAILY GRAPHIC on

day of

*James J. Connelley*  
*F. D. Bunce*

Given before me this 10th day of January 1882.

*Charles H. Peterson*  
Notary Public, City and County of New York.

# Annual Meeting of the Stockholders of The Edison Ore Milling Co. Limited.

Minutes of the annual meeting of the Stockholders of The Edison Ore Milling Co. Limited, held at the office of the Company, No. 65 Fifth Avenue, New York City, on the 17th day of January, 1882, at 12 o'clock, noon, in pursuance of the foregoing notice.

The meeting was organized by the election of Mr. S. B. Eaton as Chairman and W. H. Alldredge as Secretary of the meeting.

The meeting then proceeded to the appointment of two Inspectors of Elections, and Messrs. C. F. Huntington and H. W. Seely were unanimously elected and subscribed to the following oath:

"State of New York  
City and County of New York

"C. F. Huntington and H. W. Seely being severally duly sworn, says, each for himself: that he will discharge with fidelity the duties of the office of Inspector of Elections of Directors of The Edison Ore Milling Company, Limited, at the annual meeting of the Stockholders of said Company held January 17, 1882; and that he will not receive any vote but such as he believes to be legal, nor reject any which he believes to be legal.

"Subscribed and sworn to before me this 17th day of January, 1882."

H. W. Seely  
C. F. Huntington.

"W. H. Alldredge  
Notary public, N. Y. Co."

The polls were then declared open for the reception of votes. Mr. Eaton, the General Manager of the Company, then

presented to the meeting the following report:

"New-York, January 17<sup>th</sup>, 1882.

"To the Stockholders of The Edison Ore Separator Co. Limited:-

"I beg to lay before you a brief statement of what has been done by the Company since I was appointed General Manager June 2<sup>nd</sup>, 1881.

"Three or four days before that date I made a trip to Longue, L. I. where Mr. Edison's Ore Separator was then being used to separate the iron from the sea shore sand, for the purpose of making an inspection of its working. I prepared a report of such visit and submitted the same to the Board of Directors, who were so well pleased with the results obtained from the machine that it was resolved to send out more to prompt other trials and to furnish for the purpose of working same.

"Three men were sent out immediately but only one reported any satisfactory results. This was about 1/4 of a mile of beach at Quonset Point, R. I. which, after inspection, it was thought advisable to work by Mr. Edison's magnetic Ore Separator. Operations were accordingly commenced early in September and work has been continued up to the present time with fairly satisfactory results.

"We have had a great many mechanical and other problems to solve in the working of such beach, and thus far have gained knowledge and experience which will be very valuable to us in setting these separators to work in other places. The separation of ore from the sea shore sand by Mr. Edison's machine is almost perfect, there being only about 1/10 of one per cent of iron left in the tailings.

"So far, the result of our experiment at Quonset Point beach is, financially, as follows:

"Capital invested	\$2,548.71
"Labor	<u>1422.14</u>
	\$3970.85

"Deduct (Proceeds of ore)	
"sold (less freight)	\$356.00
"Also ore now on hand	
"worth, after paying freight	840.00
	<u>1196.00</u>
	2774.85

"From this may be deducted value	
"of engine and dynamo installed in	
"amount of Capital which as in good	
"condition say	1000.00
"Leaving still invested	<u>\$1774.85</u>

"We are, however, continuing the work of separation and expect that we shall be able to repay the money invested and something more.

"I made a very full report of our work at Rhode Island to your Board October 28<sup>th</sup>, 1881, which is recorded in the minutes.

"A number of inquiries have been made as to the purchase from us of Magnetic Ore Separators, but as yet only one has been actually sold. It is expected that in the Spring when the weather becomes more favorable to the setting up and working such machines on the sea shore, we shall be able to sell a number of separators.

"Mr. Edison is now setting up at Little Back a stamp mill



"for checking the tailings of gold and silver bearing ores,  
"preparatory to submitting them to a new process by which  
"he expects to extract use the metal. If this process should  
"prove successful it will be of very great value to the  
"Company."

"Respectfully,

"S. B. Eaton

"General Manager."

The Polls having remained open one hour and there  
being no further votes to be cast, the Directors declared  
the polls closed and made the following report:

"State of New York

City and County of New York

C. F. Hammington and H. W. Selby the Directors of  
Edison Ore Mining Company Limited, held on the 17<sup>th</sup> day of January, 1882  
hereby report that there were present at such meeting in  
person or by proxy, holders of Thirteen hundred and ninety  
three shares of the stock of said Company; that at such  
meeting thirteen hundred and ninety three votes were cast  
and that all such votes were cast for the following named  
persons as Directors of said Company for the ensuing year, viz:

J. A. Edison. James H. Bantow. R. L. Cuthing, Jr.  
Samuel Russell. W. S. Perry. R. L. Cuthing.  
W. L. Cuthing. Frank M. Laughlin. S. B. Eaton.

Dated January 17, 1882.

H. W. Selby  
C. F. Hammington.

There being no other business, the meeting adjourned.  
Attest.

W. H. Hellebrowcroft  
Secretary of the meeting.

New York February 24, 1882.

Meeting of the Directors elected at the annual meeting of the  
Edison Ore Mining Company Limited, at the office of the Company  
at 65 Fifth Avenue, this day at 4 P M.

Present

Messrs James H. Bantow, R. L. Cuthing, W. L. Cuthing,  
R. L. Cuthing Jr., W. S. Perry, Samuel Russell and  
S. B. Eaton.

The meeting was organized by the election of Mr. Eaton as  
Chairman and Mr. Perry as Secretary of the meeting.

The Directors then proceeded to ballot for officers for the  
ensuing year, with the following result:

President - James A. Edison  
Vice President - James H. Bantow  
Treasurer - R. L. Cuthing Jr.  
Secretary - W. S. Perry  
General Manager - S. B. Eaton.

Mr. Eaton, the General Manager then stated to the Board

that the separation by the Edison Machines was still being continued at Newcomb, N. J. with gratifying success, and that an order from the Poughkeepsie Co. for 150 tons of ore had been received, the first shipment having been very satisfactory. Mr. Edison also stated that efforts were being made to obtain further orders for ore.

The question of the terms for the sale or lease of the Edison magnetic ore separator was then brought up and after general discussion the following resolution was unanimously adopted.

Resolved, that the company will lease its machines for not less than one year or for a term of years, the lessee to deposit the sum of one hundred dollars in cash as security for the machine. The Company will also charge a royalty of twenty-five cents per ton of 2240 pounds of iron separated, returns of amount and payment of royalty to be made at the end of each month. The company will require a guarantee that the royalty for the first year or for any period less than a year (should the machine be surrendered before the termination of a year) shall not be less than \$300; also a guarantee that the royalty for each succeeding year or any part thereof during the continuance of the lease shall not be less than \$150 per year. Should the lessee desire to surrender the machine he will be required to surrender it in New York, freight paid and the deposit of \$600 will then be returned to him, less necessary repairs to put the machine in as good condition as new, ordinary wear and tear excepted. The Company shall always be

entitled to inspect the books and business of the lessee so far as may be necessary in the judgment of its executive officer to ascertain the number of tons separated.

The meeting then adjourned

Attest

W. J. Barry

Secretary of the meeting.

New York March 19, 1882.

Minutes of the regular quarterly meeting of the Directors of the Edison Ore Milling Co. Limited, held at the office of the Company March 19<sup>th</sup>, 1882.

No quorum appearing the meeting adjourned.

Attest

Secretary.

New York June 18, 1882.

Minutes of a regular quarterly meeting of the Directors of the Edison Ore Milling Co. Limited, held at the office of the Company June 18, 1882.

No quorum appearing, the meeting adjourned

Attest

Secretary.

New York Sept. 18, 1882.

Minutes of a regular quarterly meeting of the Directors  
of the Edison Ore Milling Co. Limited, held at the office of  
the Company September 18, 1882.

No quorum appearing, the meeting adjourned.  
Attest.

Secretary.

New York Dec. 18, 1882.

Minutes of a regular quarterly meeting of the Directors  
of the Edison Ore Milling Co. Limited, held at the office of  
the Company December 18, 1882.

No quorum appearing, the meeting adjourned.  
Attest.

Secretary.

Office of The Daily Graphic.

State of New York,

City of New York, )

*James B. Keaton*

of the City of New York, being duly sworn, says that he is the  
Editor and Proprietor of THE DAILY GRAPHIC, a daily newspaper  
published in New York City, and that the notice, of which the annexed is a copy, has been  
published in said THE DAILY GRAPHIC on the 15<sup>th</sup> 18<sup>th</sup> & 16<sup>th</sup> day of

January, 1883.

Given before me this 15<sup>th</sup> day of January, 1883.

*Thomas H. Sexton*  
Notary Public in and for the City and County of New York.

New York January 16, 1883

Minutes of the Annual meeting of the Stockholders  
of the Edison Ore Milling Company, Limited, held at the  
office of the Company, No 65 Fifth Avenue, New York City,  
January 16<sup>th</sup>, 1883, at 12 o'clock noon, in pursuance of the  
foregoing notice.

The meeting was organized by the election of Major  
S. B. Eaton as Chairman, and W. H. Merdowcroft as Secretary  
of the meeting.

The meeting then proceeded to the election of two  
Inspectors of Election, and Messrs Edward B. Davidson and

C. F. Harrington was unanimously chosen as such  
Inspector and subscribed to the following oath:

"State of New York,

"City and County of New York ss.

"Elihu E. Davidson and Charles F. Harrington

Being severally duly sworn, each for Amisef, says: That  
he will discharge with fidelity the duties of the office  
of Inspector of Election of Directors of The Edison Ore  
Milling Company, Limited, at the annual meeting of the  
Stockholders held January 16<sup>th</sup>, 1883; and that he will not  
receive any votes but such as he believes to be legal,  
nor reject any which he believes to be legal.

"Subscribed and sworn to before

E. E. Davidson

"on this 16<sup>th</sup> day of January, 1883

C. F. Harrington.

"W. H. Alldredge

Notary Public, New York County.

The polls were then, at 12:05 o'clock, declared open for  
the reception of votes.

Major Eaton, the General Manager of the Company,  
then presented the Treasurer's Report and also the following  
Report by the Board of Directors:

"To the Stockholders of the Edison Ore Milling Co., Limited:

At your last annual meeting a report was sub-  
mitted to the Stockholders of the progress made with the  
separation of iron ore from the sea shore sand at

Quononontaug, Rhode Island, and also with the general  
business of the Company.

It appeared from such report that Mr. Edison was  
carrying on experiments regarding the mining of gold and  
silver bearing ores; also that many inquiries were being made  
for our magnetic ore separators. Some of these experiments on  
gold and silver bearing ores have been made at Atlanta Park  
under Mr. Edison's direction, but owing to pressure of business,  
he has not yet been able to accomplish much in this direction.  
He has, however, made several inventions as to the separation  
of magnetic ore and of free particles of gold, for which patents  
are applied. We have also received a great number of  
inquiries as to the capacity, &c., of the magnetic ore separator  
belonging to this Company, to which the fullest replies have  
been given, but we have not yet succeeded in disposing of  
any machine. So that except for our ore separating works  
at Quononontaug, R. I., mentioned before, there is very little  
business to report for the past year.

It also appeared in the last annual report that  
separating works had been established on the sea beach at  
Quononontaug, Rhode Island, and that a quantity of iron  
had already been separated and sold. At that time we  
had just secured our first customer for this ore, namely,  
The Pangloss & Son and Shot Company. We had already  
sold them a cargo of iron, which had given such satis-  
faction that we received from them a further order for  
200 tons, funding the shipment of which a proposal was  
made to us to enter into a contract with them to supply

them with all our product at the rate of about 200 tons per month. About this time we were ready to ship 150 tons of the order above spoken of, in fact just as the vessel was about to start for the beach, we received orders from the Pugetharpis Company, not to ship this order. On enquiring into the cause of their rescinding this order, we found that they had burnt out their furnaces, were in financial difficulties, and had closed their works at Tongue Rapids. Therefore, negotiations with them were at an end. We thus met with a great drawback. This was the only customer we had, and this one had been obtained after a great deal of trouble and some expense.

The reason of this lack of demand for the ore was and is that the ore is in such small particles and requires so great a heat to melt it that it is not possible to work it in an ordinary furnace, and can only be smelted in a furnace of special construction.

The ore which should have been shipped to the Pugetharpis Company was then thrown on our hands and we were compelled to seek another market for our product. During our attempts in this matter, we had to keep on a part of our working force at the beach, so as to be ready to start up at such time as a demand could be created. We also sent a great number of samples of iron and steel manufactures all over the country, not only to produce an immediate market, but also with the intention of creating a very large demand for this ore, in order that there might also be a demand for our separators in different parts of the country.

All this, of course, made it necessary to spend money for our freight rate, at the beach and for hauling the samples to the nearest railway station, about 6 miles away.

After some time, we received an order from Messrs. Skinner & Co., Philadelphia, for 30 tons of ore, as a sample. They at the same time asked us to enter into a contract with them giving them the option to take 700 tons more within a specified time (30 days) at \$7 per ton. Inasmuch as we were informed that these were good parties, and as we desired to get a contract for a definite quantity of ore, we accepted such contract and shipped the sample 30 tons. Then came another period of waiting and endeavoring to sell more ore. At the expiration of 30 days Messrs. Skinner & Co. requested 30 tons more for a further trial before ordering a large quantity. This also was shipped and we again waited. We were informed, however, about the expiration of the time that they could not use the ore, and we were thus thrown again on our resources to find a market.

With this end in view a great number of people were sent and samples sent out, and after some time we obtained an order to ship 50 tons of ore to the American Iron and Steel Company at Rockaway, N. J. Preparations were made to ship this cargo, and a vessel went down to the beach for the iron, but parted her cable, went ashore on the rocks and was lost. Another vessel was obtained and the iron shipped. This last vessel, however, only got us far as Stoughton, when it was discovered that she was taking badly and could not go any further. Then came another transfer of the cargo to steel.

another vessel, by which the iron was at length delivered. All this, of course, meant delay and expense.

In the meantime, as before, our prospects and some other minor expenses had to be met. Then, after the ore was received at Rockaway, the American Sweden Iron Company said that it was not equal to samples and that they could not take it. This involved the necessity of sending for our Superintendent from Rhode Island to meet them and demonstrate that we had shipped the ore according to our contract and samples. He came on here and went to Rockaway and after some trouble succeeded in bringing them to accept the ore.

The American Sweden Iron Company ordered the ore in five furnaces, which were specially designed for ore of this character, and were so well pleased with the results that they ordered another cargo of 50 tons in view of this shipment was good. The ore was delivered to them, and they again objected to it as not being in accordance with their sample. This sample was one which they claimed had been given by us to them and was entirely clean. It was so clean that our Superintendent and others gave it as their opinion that it had been cleaned with a hand magnet. Our cargo of 50 tons was not as clean as the sample, but was as we agreed to furnish it. The upshot of the matter was, after another visit of our Superintendent to them, that we came to the conclusion to make a reduction in the price of the ore, rather than go to the expense of moving it away and running it through the separator again. This decision was also based on the fact that these people seemed disposed to give a great deal of trouble and did not

pay promptly, besides, on the last visit of our Superintendent to their works, he saw that their mills were stopped and they were doing no work. This was not during the recent strike in the iron trade, but was soon after.

Our experience with the American Sweden Iron Company, not only with these two cargoes of ore, but for some time previously, warranted us in coming to this conclusion that we should not be justified in attempting to do further business with them, as they have been uncertain and not to be dependent upon.

Inasmuch, therefore, as we had no other customers for ore, and it being uncertain when a demand therefor would exist, it has been thought best to close our works at Quonocontung, bring back the separator to New York, and so conduct the business of separating ore ourselves. This has been done, and our equipment at Rhode Island was now at an end.

In commencing this undertaking in August, 1881, we were assured by people in the iron business that there was an unlimited market for all the ore we could produce, and it was thought that we could realize the money invested, together with a profit. Our separator had not at that time been practically tested. It is true that Mr. Edison had made a great number and variety of tests at West Park, and the machine had also been worked on the beach at Long's Park, for a short time, but none of these tests had demonstrated what work the separator was capable of doing when it came to run well in and wash out on a commercial basis. It was thought both necessary and desirable that an experiment should be made to furnish us with such data, and, therefore, the operations at

Rhode Island were commenced. At the start and until after the first cargo of iron had been shipped, there did not appear to be much difficulty in obtaining a market for our ore, and we expected to make a profit of about \$12. per ton, but our market failed us above set forth and rates became spasmodic, thus putting us to expense without being able to realize any immediate returns.

Again, we have been placed under nearly every possible disadvantage in our operations at Rhode Island; we were 6 miles away from the nearest railway station, and 10 miles away from the nearest large town. Fueling was expensive and not always to be obtained, we had no lumber or sets in which to load vessels, our beach being right on the ocean and without shelter of any kind. It has for this reason been difficult to get us used to take as cargo from the beach. In fact there have been an innumerable host of petty details, annoyances and drawbacks connected with the operations at Quonocontung, which, apart from pecuniary matters, have been not and overcome with no small degree of patience and energy.

Notwithstanding all these disadvantages, however, we have made a practical demonstration of what can be done with the Union Ore Separator, not only in regard to how much ore can be separated in a day and at what expense, but also in regard to the best method of setting up the necessary machinery to be worked in connection with the separator. All these conclusions have been arrived at, however, by means of numerous experiments, the cost of which, is included in the

plant and running expenses at Quonocontung.

It should be said, that if we had had a regular market for our separated ore, we could have made a profit of about \$3<sup>00</sup> or \$4<sup>00</sup> per ton, even after taking into consideration all the disadvantages under which we were placed at Quonocontung. It was upon this basis that the plant was kept in existence, and the expense continued for so long a time, for the reason that if we could, at any time before closing, have found a regular market for all our product, we could have realized all the money we have spent and possibly made a profit besides. The difficulty is not with the ore, as that is of the best quality, but there is no market in existence which will consistently and continuously absorb this ore, and on account of its future use, if it being accordingly used and bought.

We submit herewith a summarized statement of the money spent on these experiments at Rhode Island and of the money received from sales of ore, &c. This statement shows the expenditures to have been as follows:

Plant . . . . .	\$2672.39	
Running Expenses . . . . .	4,111.00	
Accessories . . . . .	508.17	\$7,291.56

And the receipts for ore sold to amount to . . . . .	1,513.12	
Account due . . . . .	250.00	
Rate of building . . . . .	129.00	
Sale of engine . . . . .	600.00	2,492.12
Balance . . . . .		\$4,832.44

Showing the cost to the Company of the experiments at Rhode

Balance to amount to \$14,832.441.

It is not without a feeling of regret that your Board has felt obliged to cease operations at Zimmerman's without having at last realized enough from the sale of ore to pay back the money invested. Such is the fact, however, and after the most strenuous efforts which have been made to interest possible purchasers of ore, and after the diligent enquiries which have been made to find a suitable furnace in which to smelt the ore, both without success, we have deemed it most expedient for the best interests of the stockholders to close out the business and save any further expense.

We believe, however, that during the present year there will be a number of operations required for large deposits of magnetite now in Canada and elsewhere. Mr. Edison also believes that during the present year he will be able to develop some kind of the continuation of the experiments for the profitable melting and treatment of low-grade silver and gold ores, in which, if he is successful, there will be a future of vast profit for the Company.

The price now at 1:05 stock stands closed and the inspectors made the following report:

State of New York  
City and County of New York

Edward E. Davidson and Charles F. Harrington, the inspectors of election at the annual meeting of the stockholders of the Edison Ore Melting Company, Limited, held on the 16<sup>th</sup> day

of January, 1883, hereby Report, that there were present at such meeting in person or by proxy, Andrew Davidson hundred and fifty five shares of the stock of such Company; that at such meeting William Thomson and ninety five votes were cast, and that all such votes were cast for the following named persons as Directors of said Company for the ensuing year: Thomas A. Edison, James H. Barker, J. B. Eaton, R. L. Cutting, R. P. Cutting, Jr., W. L. Cutting, W. S. Perry, Samuel Bruce and Frank M. Laughlin.

Dated New York, January 16, 1883.

C. F. Harrington,

Edward E. Davidson.

There being no further business, the meeting adjourned.

Attest

W. Holladsworth

Secretary of the meeting.

New York January 26, 1883.

Meeting of the Directors held at the annual meeting of January 16<sup>th</sup>, held at No. 65 Fifth Avenue, New York City, January 26, 1883.

No quorum appearing the meeting adjourned.

Attest

Secretary





Messrs E. E. Davidson and J. M. Gowen were then appointed Inspectors of Election, and subscribed to the following oath:

"State of New York  
City and County of New York."

Edward E. Davidson and J. M. Gowen being solemnly duty sworn, each for himself, says that he will discharge with fidelity the duties of the office of Inspector of Election of Directors of the Edison Ore Mining Company, Limited, at the annual meeting of the Stockholders to be held this 15<sup>th</sup> day of January, 1884.

"Subscribed and sworn to before me, this 15<sup>th</sup> day of January, 1884." Edward E. Davidson  
J. M. Gowen

"Wm H. Alsteadcroft

"Notary public, N.Y.C."

The votes were then, at 12.05, declared open.

The General Manager, Mr. S. B. Eaton, then presented the following report of the Board; which Report was on motion approved and ordered to be recorded as part of the minutes of this meeting. The report is as follows:

"To the Stockholders of the

Edison Ore Mining Company, Limited:

Your Board have little to report as to the operations of the Company during the past year. We expected to have a number of the magnetic iron ore

separators in operation in Canada last Spring, but owing to the fact that successful means of smelting the ore had not been devised, the owners of the deposits were not willing to go to the expense of separating ore if they could not find a market for it.

This was our main trouble when we were operating a separator at Quonochontong Beach, as stated in the last annual Report. In that Report it was stated that we had ceased work and closed our business on that beach, because we could not find a market for our product. This cost to the Company of this experiment was \$4,832.44.

The financial resources of the Company are low. There is owing to Mr. Edison about \$1650 for machinery, experiments, &c. The cash advanced to the Company by the General Manager, Mr. S. B. Eaton, amounting to \$1,577.89, which was owing to him a year ago, is still unpaid; and this amount, together with some other small advances for petty cash expenses, is still owing to him. We also owe \$848.17 for taxes and \$250 to the Farmers Loan & Trust Co., for acting as Registrar of the Stock. There is no cash in the Treasury with which to pay these debts, nor have we any cash to pay our current expenditures.

Since the closing of the operations at Rhode Island, Mr. Conley, who was employed as Superintendent there, has devoted his time and attention to devising means for the successful reduction of the ore to a marketable product. After spending over a year in numerous experiments, Mr. Conley believes he has invented a process which will accomplish this result, and has received

some capital for the purpose of erecting a furnace in the spring, when he expects to commence the manufacture of iron and steel from the magnetic iron ore. Mr. Ell's process proves successful, it will open up a large demand for magnetic iron ore, and, consequently, for the ore separator.

Mr. Edison's experiments as to gold and silver ores have been limited, owing principally to want of funds. There having been no money in the treasury for the last year and a half. He has conducted a great deal of experimenting at his own expense, paying for it himself, but it is not probable that any further considerable experiments will be made until the treasury is supplied with adequate funds."

The polls having been open one hour, were at 1.05 P. M. suddenly closed, and the following report was presented by the Inspector:

"State of New York  
City and County of New York") ss.:

Edward E. Davidson and J. M. Gowan the Inspectors of Election at the annual meeting of the stockholders of the Edison Ore Mining Company, Limited, held this 15<sup>th</sup> day of January, 1884, hereby

Report that there were present at such meeting in person and by proxy Ten Hundred and sixty two shares of the stock of such company; that at such meeting the following votes were polled for Directors, viz:

For Thomas A. Edison	1066 votes
" James H. Randow	1066 "
" S. B. Eaton	1066 "
" R. L. Gilling	1066 "
" R. L. Gilling Jr	1066 "
" W. L. Gilling	1066 "
" W. J. Barry	1066 "
" Samuel Drance	1066 "
" Frank McLaughlin	1066 "

There being no other votes cast, the above named gentlemen were declared the duly elected Directors to serve for the ensuing year.

Dated, New-York, January 15, 1884.

J. M. Gowan  
Edward E. Davidson."

There being no further business to be transacted, the meeting adjourned.

W. H. Macdonough  
Secy. of the meeting.

New-York Feb'y 19<sup>th</sup> 1884

Meeting of the directors of the Edison Ore Mining Co. Limited, called at the annual meeting, Jan'y 15, 1884, held at No. 65 Fifth Avenue, New-York City, Feb'y. 19, 1884 at 4 o'clock, P. M.

Present

S. B. Eaton, Samuel Insull, W. L. Cuttng,  
W. S. Perry, and J. A. Edison.

The meeting was organized by the election of S. B. Eaton as Chairman, and W. H. Holladowcroft as Secretary of the meeting.

The meeting then proceeded to the election of officers, and a ballot was had with the following result:

President Thomas A. Edison

Vice President James H. Barber

Treasurer R. L. Cuttng J.

Secretary W. S. Perry

Gen. Manager S. B. Eaton.

There being no other business the meeting adjourned.

Attest

W. H. Holladowcroft

Secy. of the meeting.

New York March 17<sup>th</sup> 1884.

Minutes of a regular quarterly meeting of the Directors of the Edison Ore Milling Co. Limited, held at No. 65 Fifth Avenue, New York City, on Monday March 17, 1884 at 4 P.M.

No quorum being present the meeting adjourned.

Attest

Secretary

New York January 19, 1885

A special meeting of the Directors of the Edison Ore Milling Company, Limited, was held at the office of R. L. Cuttng, Esq. No. 19 William Street, New York City, on the 19<sup>th</sup> January, 1885, at 2 o'clock P.M., for the purpose of passing the annual report.

Present

R. L. Cuttng

R. L. Cuttng J.

W. L. Cuttng

S. B. Eaton

Samuel Insull

W. S. Perry

J. A. Edison.

The Annual Report to be read at the annual meeting of stockholders tomorrow was presented to the meeting and on motion approved.

The meeting then adjourned.

Attest

Secretary.

The Annual meeting of the stockholders of the Edison Ore Milling Company, Limited, was held pursuant to the By Laws, at the offices of the Company, No 65 Fifth Avenue, New York City, on Tuesday the 20<sup>th</sup> day of January, 1885, at 12 o'clock noon.

The meeting was organized by the election of S. B. Eaton as Chairman and W. H. Meadowcroft as Secretary of the meeting.

An affidavit of the publication of the notice of this meeting was presented, and on motion ordered to be recorded as part of the minutes of this meeting.

Messrs. F. M. Gowen and Edmund A. Lizer were then appointed Inspectors of Election, and subscribers to the following oaths:

State of New-York  
City and County of New-York, ss:

F. M. Gowen and Edmund A. Lizer being severally duly sworn, each for himself, depose that he was discharging faithfully the duties of the office of Inspector of Election of Shares of the Edison Ore Milling Company, Limited, at the annual meeting of the stockholders to be held this 20<sup>th</sup> day of January, 1885, and subscribe and swear to before me: F. M. Gowen,  
this 20<sup>th</sup> day of January, 1885. Edmund A. Lizer.

(W. H. Meadowcroft)

Notary Public, N.Y.C.

The doors were then at 12:05 declared open.

The General Manager, S. B. Eaton, then presented the following report which was on motion approved and ordered to be recorded as part of the minutes of this meeting. The report is as follows:

"To the Stockholders of

The Edison Ore Milling Company, Limited.

Your Board have to report that little has been done during the past year. Negotiations with certain parties whereby this Company was to give them an exclusive right for using the separator for extracting iron ore from said ore.

for an adequate consideration from this Company have been carried out, and it is probable that our arrangement of this fund will be successfully consummated provided the same parties are successful in securing certain patents, the applications for which are now pending in the Patent Office, touching certain details. If this arrangement is made it will ensure some income to this Company.

The financial resources of the Company are still in a very bad condition no important change having taken place since the last report. In the last annual report it was stated that there was then owing to Mr. Edison about \$1100 for machinery, experiments, &c. Also the sum of \$1077 1/2 to the General Manager, A. R. Edison, for cash advances, together with other small amounts advanced by him for petty cash expenses. Also the sum of \$481.17 for losses, and the sum of \$20 to the Finance Loan & Trust Company for acting as depositors of the stock.

The foregoing amounts, mentioned in the last Annual Report are still unpaid. Frequent demands have been made for payment, and Major Edison, especially, has been, and still is, very desirous of being paid the amount due to him. During the year now closing he has advanced additional trifling amounts for petty cash disbursements. Mr. Edison has also made additional advances. There is another year (\$416.68) now just been added for; also another annual payment to the Finance Loan and Trust Company, for continued services as above stated. There is no money to meet these various demands, and there are no assets of any kind out of which money can be realized, except 420

shares of stock.

Your Director earnestly urges the importance of raising money to discharge the above named obligations of the Company.

During the past year Mr. Edison has made some further experiments as to gold and silver ore. Such experiments as he has conducted the past year have been carried out, as they were also during the previous year, at his own expense. Your Director desires to impress strongly upon the stockholders the importance of raising money to enable Mr. Edison to proceed with his experiments.

In concluding this Annual Report, your Board of Directors desire to reiterate their belief in the ultimate profits to be derived from the business of the Company, provided Mr. Edison's experiments are continued until the expected results realized.

The polls having been open one hour, they were declared closed and the following report was made by the inspectors:

State of New York.

City and County of New York: ss.

I, A. L. Sproun, Lieutenant of Police, the Inspector of Election at the Annual meeting of the Stockholders of the Edison Ore Mining Company, Limited, held this 20<sup>th</sup> day of January, 1885, hereby

Report that there were present at such meeting in person or by proxy 1017 shares of the stock of such Company; and that at such meeting all of the said shares of stock voted for the following named Directors, viz:

Thomas A. Edison 1017 votes

James H. Hunter 1017 "

Charles Batchelor	1047	votes
Samuel Insull	1047	"
R. L. Guthrie	1047	"
R. L. Guthrie Jr.	1047	"
W. L. Guthrie	1047	"
W. L. Gray	1047	"
Frank M. Langdon	1047	"

Edison New York, January 20, 1888

To all "yours"  
 Edmund Langer."

There being no other votes cast, the above named gentlemen were declared duly elected as Directors to serve for the ensuing year.

The meeting was then on motion adjourned.

Attest

W. H. Woodward,

Secy. of the meeting.

# Special meeting of the Board of Directors of the

## Edison Ore Milling Company, Limited.

Had on the 7th day of December 1888 at 19  
 William Street City.

Present. W. L. Gray, Sam. Edison, R. L. Guthrie Jr.  
 Charles Batchelor and Samuel Insull.

Mr Edison Presided.

On motion of Mr Guthrie seconded by Mr  
 Gray Mr Thomas Edison was unanimously elected  
 President for the current year.

On motion of Mr Insull seconded by Mr  
 Batchelor Mr R. L. Guthrie Jr. was unanimously  
 elected Treasurer for the current year.

On motion of Mr Gray seconded by Mr  
 Guthrie Mr Samuel Insull was unanimously  
 elected Secretary for the current year.

On motion of Mr Guthrie seconded by Mr  
 Batchelor Messrs Francis R. Wykes and Mr W. L.  
 Garner were elected Directors to serve in place  
 of Messrs W. L. Guthrie and J. P. Rankin deceased.

The Secretary presented an agreement between  
 the company and the New Magnetic Iron Ore and on  
 the motion of Mr Guthrie seconded by Mr Gray the same  
 was approved and the President authorized to sign the agree-  
 ment on behalf of the company and the Secretary instructed  
 to affix the corporate seal thereto.

On motion of Mr Batchelor the meeting adjourned.

Minutes of Special Meeting

of the

Board of Directors of the Edison Ore Milling Company,  
Limited, held at 110 Wall St. in the City of New York on  
the 11 day of August 1887

Present

Thomas A. Edison,  
Charles Butcher,  
Samuel Insull,  
W. S. Perry, and  
W. M. Lumsden, Directors.

The President, Mr. Thomas A. Edison in the Chair.

The minutes of last meeting were read and approved.

The attention of the Board having been called to the fact that  
there was a vacancy in the Board of Directors owing to the death  
of Mr. Robert L. Cutting Jr., Mr. Perry moved, seconded by Mr.  
Insull that Mr. John W. Lumsden be elected a Director of  
the Company in the place of Mr. Robert L. Cutting deceased.

The motion having been put was unanimously carried.  
Mr. Lumsden then attended the meeting as one of the Directors of  
the Company.

The resignation of Mr. Thomas A. Edison as President of the  
Company was presented to the Board.



It was moved by Mr. Garner, and seconded by Mr. Gatchelton, that the resignation of Mr. Thomas & Edison as President be accepted.

The motion having been put was unanimously carried.

Mr. Perry then nominated as President of the Company in place of Mr. Edison resigned, Mr. John C. Hutchinson.

The nomination having been duly seconded the Board proceeded to the election of a president by ballot as required by the by laws of the Company. Mr. James Nugent was appointed as teller, who after counting the votes reported that Mr. Hutchinson had been unanimously elected President.

Mr. Hutchinson then took the chair and presided throughout the rest of the meeting.

Mr. Nelson having resigned as Secretary of the Company, Mr. Perry moved that Mr. P. W. Smith be elected as Secretary in his stead.

The motion having been duly seconded by Mr. Gatchelton a ballot was taken, and Mr. James Nugent appointed as teller who after counting the votes reported that Mr. P. W. Smith had been unanimously elected Secretary of the Company in place of Mr. Nelson resigned.

Mr. Samuel Ansell having resigned as Secretary it was moved by Mr. Perry and seconded by Mr. Garner that Mr. W. L. Perry be appointed and elected Secretary of the Company. A ballot having been taken, the motion was unanimously

carried.

The President of the Company then submitted to the Board a proposition for the re-organization of the Company under Mr. Edison, which was read and discussed by the Directors of the Company. After having been so read the following resolution was offered by Mr. W. L. Perry and its adoption moved by him:

Whereas, Mr. Thomas A. Edison has submitted to the Directors of this Company, a proposition for re-organization which proposition has been read to the Board, therefore

Be it Resolved, that the plan of re-organization submitted by Mr. Edison be, and the same hereby is approved by the Directors of the Company; and

Be it further Resolved, that such proposition together with a statement of the affairs of the Company in the form submitted by the President be printed and sent to each Stockholder of the Company.

Be it further Resolved, that a meeting of the Stockholders of the Company be called, to be held on the 15<sup>th</sup> day of September next at the office of Mr. John C. Hutchinson at 20 Wall Street N.Y. to consider the advisability of re-organizing the Company on the plan submitted, and if thought wise so to do, to take the necessary steps to carry out such plan of re-organization; and

Be it further Resolved, that as proxy in favor of Mr. John C. Hutchinson or Mr. W. L. Perry be sent to each Stockholder with the said statement, together with a formal notice of the holding of such meeting, and that the Secretary at the same time be directed to write each Stockholder respecting the execution of such proxy.

The machine having been duly examined by Mr. Thomas was put by the President, when it was unanimously agreed with the resolution as unanimously adopted. —

The Secretary was directed, after the reading of the report, and as first proposed to appear in the Minute Book, copies of each abstract, paper, a list of meeting and letters.

— The Board then adjourned —

### Proposed Plan of Reorganizing the Edison Arc Lighting Company Limited.

To the Stockholders of the Edison Arc Lighting Company  
Limited:

Sir: I have:

This Company was incorporated on the latter part of  
November, 1879, with a capital of \$550,000, divided into 3,500  
shares of the par value of \$100. each.

On the 17<sup>th</sup> day of January 1880, in contract was entered into between Mr. Thomas A. Edison and the Company, whereby he assigned to them certain agreements made by him with the Edison Arc Lighting Company, with the Big River Hydraulic Travel & Ferry, and with Messrs Powers, Squire and Elliot; also the entire interest in his inventions relating to the manufacture of Chlorine Water, and all other inventions made by him pertaining to the construction of incandescent lamp, lighting, gas, and  
X C

Mr. Edison also agreed to prosecute his experiments relating to the incandescence apparatus, and assign any further invention he might make to the Company. In consideration of this the Company issued to him \$250,000 of its Capital Stock; agreed to pay all the expenses of the experiment, and in addition an annual salary of \$10,000. a year, provided that dividend was earned by the Company and 30 per cent of the net profits of the Company remaining after paying such salary, and a dividend of 20 per cent on its outstanding stock.

In the early part of January, 1880, 500 shares of the Edison Arc Lighting Company were sold at par value, namely \$100. to \$125.00 a share. The Company realizing \$125,000. a cash.

At the annual meeting of the Stockholders of the Company held on the 18<sup>th</sup> day of January 1881, the report of the Board of Directors stated that the assets of the Company consisted of \$15,831.49 and Letters Patent and contracts, and that the working capital did not exceed \$250.

During the year 1881 the Company was engaged in experimenting upon reproducing the same from magnetic iron oxide, according to the methods covered by the inventions of Mr. Edison and owned by the Company, and a large amount of money was expended in this direction.

During the year 1882 experiments and work on this subject were continued.

From the report to the stockholders at the annual meeting in January 1883, it appeared that the experiments of the Company for reproducing the same from magnetic iron oxide were in complete success, but that difficulty had been found in making

The no vote it had been reported, and because of this the Company had been unable to develop its business.

Attention was called to the fact that Mr. Edison's numerous engagements had prevented him from devoting much time to experiments on separating the various metals from which some one had thought to be able to do so within the coming year.

During the year 1883 the business of the Company was practically at a standstill. By the report to the Shareholders at their annual meeting on the 15<sup>th</sup> day of January 1884, it appears that the Company was indebted in the sum of about \$1,500; that there were no funds in the Treasury with which to pay its indebtedness; and owing to this want of funds Mr. Edison had been prevented from conducting experiments on gold and silver ores; and the attention of the Shareholders was called to the fact that while he had recommended experiments in this direction at his own expense, the Company could not expect they would be continued unless the Treasury was supplied with adequate funds with which to pay for them.

During the year 1884, owing to want of funds in business relations were done by the Company. From the report to the Shareholders, presented at the annual meeting on January 20, 1885, it appears that the debt referred to in the last annual report had not been paid, but that on the contrary the debt of the Company there specified the sum of about \$3,500; that there was no money in the Treasury and no way of liquidating

these debts, as the only assets of the Company consisted of 10,000 shares of its capital stock, which had so far depreciated in value that they would not be sold at any price.

The directors upon being apprised of the necessity of raising money to discharge the obligations of the Company, and to enable Mr. Edison to continue his experiments mentioned, was also made of the fact that during the year he had conducted a number of experiments at his own expense.

From January 1883 until the present time no business has been done by the Company, and its affairs have remained at a standstill. The Company is without funds to enable Mr. Edison to continue his experiments and has no means of raising them. The few shares of stock in its treasury are practically worthless and valueless.

When the Company was organized it was thought that large profits would be at once realized from its inventions for separating magnetic rare metals, but after large expenditures it was found that while the inventions of Mr. Edison did all that was claimed for them, they were rendered of no commercial value because of a difficulty, not then anticipated, in recovering the iron after separation.

It has always been the opinion of Mr. Edison that in the proper facilities for experimenting at his disposal, he could find means of separating the various rare metals, &c. Many experiments have been conducted by him in this direction at his own expense, without discharging the obligations on the part of the Company to pay for them.

expressly provided in the contract between him and the Company.

The Company being without funds and Mr. Edison being unwilling and unable to pay the expenses of further experimentation the property of the Company must be regarded as valueless unless some new arrangement can be made with Mr. Edison by which these experiments can be prosecuted.

After consultation with your Board of Directors he has submitted the following proposition:

That the capital of the Company be increased from its present capital of \$350,000 to \$2,000,000.

That of such \$2,000,000 \$525,000 in stock be issued to the present stockholders upon their surrendering the stock now held by them, thus giving to each stockholder one and a half shares of stock in the re-organized Company for each share now held by him.

That \$1,475,000 in stock be issued to Mr. Edison in consideration of his making a new agreement with the Company, \$350,000 of which is to be paid by him in the treasury of the Company, to be used for developing its business.

The new contract with Mr. Edison should provide that he will actively devote himself to superintending upon separating the previous contracts from the intellectual ones, and will assign any inventions made by him relating to the same to the Company.

That we will relieve the Company from its present obligation to pay him an annual salary of \$10,000 and 30% of the net profits of its business and release it from

all earnings now due him amounting to several thousand dollars.

That he will construct an special laboratory for experiments on separating ones, and will prosecute his experiments extensively, advancing therefor from his own pocket whatever sums may be necessary up to \$25,000.

For cause his experiments do not result successfully Mr. Edison will make no claim on the Company to reimburse him amount. Should he succeed, however, he will take as payment of his advances bearing stock at a value to be fixed by the Board of Directors or cash realized from the sale of such stock.

Your Board of Directors, after careful consideration of the subject, are convinced that the proposition submitted by Mr. Edison is eminently fair and in the interests of the stockholders should be carried out. Unless it be effected on some other plan of re-organization recommended through your Board one of the expenses that the corporation should be disbursed and its affairs liquidated.

The Board of Directors of the  
Edison Ore Milling Company, Limited.

Know all men by these Presents that I  
to her, my coheir, and assigns John C. Tomlinson and  
H. L. Perry, or either of them my Attorney, and Agents  
for me, and in any court, place and stand to vote as  
my proxy at a Special meeting of the Stockholders  
of the Edison Electric Lighting Company, Limited & Co.  
held on the 13<sup>th</sup> day of September 1887, on all every  
adjournments thereof. According to the records of  
votes I should be entitled to vote if then and there  
personally present, hereby reserving all other and special  
powers of Attorney or proxy if any such there be.  
My Witness therefore, I have hereunto set my hand  
and seal this            day of            1887  
Signed, sealed and delivered }  
in presence of

New York August 5<sup>th</sup> 1887  
Witness:  
A Special Meeting of the Stockholders of the  
Edison Electric Lighting Company, Limited, will be held  
at the office of Mr. John C. Tomlinson No 41  
Wall St New York City on the 13<sup>th</sup> day of September  
1887, at 12 O'Clock noon, to consider in proposition to  
reorganize the Company and increase its capital  
share from its present capital of \$300,000 to  
\$2,000,000 which is thought advisable so to do

to take the necessary steps to effect such reorganization and  
such increase.

By Order of the Board of Directors  
W. S. Perry  
Secretary

New York, August 5<sup>th</sup> 1887  
Dear Sir:

Enclosed you will find a Notice of a Special  
Meeting of the Stockholders of the Edison Electric Lighting  
Company, Limited, and a statement of the Board of  
Directors of the affairs of the Company, and recommending  
that its capital stock be increased and the Company reorga-  
nized in the manner set forth.

If you approve of carrying out the recommendations  
of the Board, will you either attend the meeting in person  
and vote in favor of the proposed proxy.

Yours truly,

W. S. Perry  
Secretary  
41 Wall Street, New York

x

Minutes of Meeting of Stockholders  
of the

Edison Ore Milling Company, Limited held  
at the Office of Mr John C. Tomlinson in  
40 Wall Street in the City of New York on  
the 13<sup>th</sup> day of September 1887

The following stockholders owning  
the number of shares set opposite their  
respective names were present at the  
meeting

Wm. John C. Tomlinson and W.  
J. Perry appearing as proxy for

Name	No of Shares
Richd. L. Ayer	1
J. H. Vail	1
H. W. Leely	1
Samuel L. Rogers	10
Geo. T. Tillstrand	1
Joseph McElgown	50
Thos. F. McCarthy	50
President A. Postbridge	1
J. Chicago	1
William P. Berger	1
E. C. Howland	1
J. C. Tomlinson	1
David Tomlinson	1
J. H. McElmont	1
C. E. Smith	1

Name	No of Shares
Henry Reiner	1
G. L. Selden	1
Thomas Maguire	1
W. J. Lyne	1
L. H. Palmer	1
W. C. Tate	1
John J. Randolph	1
Frank A. Kiddle	1
C. J. Kiddle	1
C. G. Stachbury	1
W. H. Kiddle	1
Joseph B. Harnick	1
Chas. Huntington	16
Harbo. E. Co	8
Alexander A. Perry	2
Arch. Parker	1
F. W. Toffan	1
G. C. McKuen	3
Herman Livingston	2
John W. Kohlhaas	3
Dr. F. Owens	1
Iselle McKuen	1
Charles Francis Stone	13
Augusta McKuen	1
Dr. E. Connor	10
Ida L. Perry	1
Dr. H. Christad	1
Chas. Schorder	2

name	No of Shares
Miller	
John H. Glendon	1
Samuel Grant	14
C. H. Howard	12
W. L. Rogers	24
C. B. Wilson	5
Henry W. S. Mable	2
Frank M. Langdon	30
J. H. Smith	4
Commencement Co	1
S. W. Eldon	5
Thomas M. Edison	933
B. N. Be Tralf	2
C. H. Neason	3
W. E. Nyer	1
Charles L. Clark	10
C. L. Commencement	5
James Elyne	18
Edward Clark	1
Wm. Cutting	30
Samuel P. Colt	2
B. E. Chilton	5
Henry W. Bailey	1
Charles Batchelor	100
Isaac Bell	1
H. E. Bassett	1
H. W. Toffan	1
Andrew H. Pluman	1

name	No of Shares
Geo Bond	5
Telghman Bond & Co	10
Shops P. W. Smith and W. S. Perry	
appearing as party for	
name	No of Shares
Ward & Co	181
M. W. Selding	10
Grace H. Mullen	10
Margaret E. Lantz	10
W. L. Appleton & Co	40
Estate of J. H. Barker	
Samuel T. Warden	10

The meeting was organized by the selection of Mr John C. Tomlinson, one of the Directors of the Company, as Chairman, and Mr W. S. Perry as Secretary

The Chairman read to the Board the following notice of this meeting

NEW YORK, August 5th, 1887.

DEAR SIR:

A Special Meeting of the Stockholders of the EDISON ORE MILLING COMPANY, LIMITED, will be held at the office of Mr. John C. Tomlinson, No. 40 Wall Street, New York City, on the 13th day of September, 1887, at twelve o'clock noon, to consider a proposition to reorganize the Company and increase its Capital Stock from its present Capital of Three Hundred and Fifty Thousand Dollars to Two Million Dollars, and if thought advisable so to do, to take the necessary steps to effect such reorganization and such increase.

By order of the Board of Directors.

W. S. PERRY,

Secretary.

To

The Chairman also read to the Board the following proposed plan of reorganizing the Edison Ore Milling Company, Limited, signed by the Board of Directors and sent to each of the Stockholders, and also read the

STANDARD "QUAD" TYPE, 1880-1890 B1. 2. 3.

NEW YORK, August 5th, 1887.

DEAR SIR:

Enclosed you will find a notice of a Special Meeting of the Stockholders of the EDISON ORE MILLING COMPANY, Limited, and a statement of the Board of Directors of the affairs of the Company, and recommending that its capital stock be increased and the Company reorganized in the manner set forth.

If you approve of carrying out the recommendation of the Board, will you either attend the meeting or execute and return to me the enclosed proxy?

Yours truly,

W. S. PERRY,

Secretary.

40 WALL STREET, NEW YORK.

To



The meeting was organized by the selection of Mr John C. Tomlinson, one of the Directors of the Company, as chairman, and Mr W. S. Perry as Secretary

The chairman read to the Board the ~~minutes~~ notice of this meeting

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clock

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Dollars

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To

The Chairman also read to the Board the following proposed plan of reorganizing the Edison Ore Milling Company, Limited, signed by the Board of Directors and sent to each of the Stockholders, and also read the

STAMPED "Q13" FEB. 14 1890 CHAS. B. P.

Heretofore in

Know all Men by these Presents: THAT I,

do hereby constitute and appoint John C. Tomlinson and W. S. Perry or either of them, my attorneys and agents for me, and in my name, place and stead to vote as my proxy at a special meeting of the Stockholders of the Edison Ore Milling Company, Limited, to be held on the 13th day of September, 1887, or at any adjournments thereof. According to the number of votes I should be entitled to vote if then and there personally present, hereby revoking all other and former powers of attorney or proxies, if any such there be.

In Witness Whereof, I have hereunto set my hand and seal this ..... day of ..... One Thousand Eight Hundred and Eighty-seven.

Signed, sealed and delivered }  
in presence of }

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The meeting was organized by the selection of Mr. John C. Sanderson, one of the Directors of the Company, as Chairman and Mr. W. L. Perry as Secretary.

The Chairman read to the Board the following motion to this meeting:

The Chairman also read to the Board the following proposed plan of reorganizing the Edison Ore Milling Company, Limited, signed by the Board of Directors and sent to each of the Stockholders.

also read the Secretary in my was enclosed

**Proposed Plan of Reorganizing the Edison  
Ore Milling Company, Limited.**

TO THE STOCKHOLDERS OF THE EDISON ORE MILLING  
COMPANY, LIMITED:

GENTLEMEN—This company was incorporated in the latter part of December, 1879, with a capital of three hundred and fifty thousand dollars, divided into thirty-five hundred shares, of the par value of one hundred dollars each.

On the 19th day of January, 1880, a contract was entered into between Mr. Thomas A. Edison and the company, whereby he assigned to them certain agreements made by him with the U. S. Mining Investment Company, with the Big Bar Hydraulic Gravel Company, and with Messrs. Powers, Soule and Miller; also the entire interest in his inventions relating to the manufacture of Chlorine Water, and all other inventions made by him pertaining to the extraction of metals from ores, tailings, gravel, &c.

Mr. Edison also agreed to prosecute his experiments relating to the inventions aforesaid, and assign any further invention he might make to the company. In consideration of this the company issued to him \$285,000 of its capital stock; agreed to pay all the ex-

The meeting was organized by the selection of Mr. John C. Lombard, one of the Directors of the Company as Chairman and Mr. W. S. Perry as Secretary.

The Chairman read to the Board the following

penses of his experiments, and in addition an annual salary of \$10,000 a year, provided that amount was earned by the company, and 30 per cent. of the net profits of the company remaining, after paying such salary, and a dividend of 20 per cent. on its outstanding stock.

In the early part of January, 1880, 220 shares of the treasury stock of the company were sold at prices varying from \$100 to \$250 a share, the company realizing \$26,750 in cash.

At the annual meeting of the stockholders of the company, held on the 18th day of January, 1881, the report of the Board of Directors stated that the assets of the company consisted of \$16,831.46, and letters patent and contracts, and that its existing debts did not exceed \$250.

During the year 1881 the company was engaged in experimenting upon separating the iron from magnetic iron sands, according to the methods covered by the inventions of Mr. Edison and owned by the company, and a large amount of money was expended in this direction.

During the year 1882 experiments and work on this subject were continued.

From the report to the stockholders at the annual meeting on January 16th, 1883, it appeared that the inventions of the company for separating the iron from magnetic sands were a complete success, but that difficulty had been found in smelting the ore after it had been separated, and because of this the company had been unable to develop its business.

Attention was called to the fact that Mr. Edison's numerous engagements had prevented him from devot-

The Chairman also read to the Board the following proposed plan of reorganizing the Edison Ore Smelting Company, Limited, signed by the Board of Directors and sent to each of the stockholders, and also read the

Secretary in  
ry was succeed

ing much time to experiments on separating the precious metals from rebellious ores, but that he hoped to be able to do so within the coming year.

During the year 1883 the business of the company was practically at a standstill. By the report to the stockholders at their annual meeting on the 15th day of January, 1884, it appeared that the company was indebted in the sum of about \$4,500; that there were no funds in the treasury with which to pay the indebtedness; that owing to this want of funds Mr. Edison had been prevented from conducting experiments on gold and silver ores; and the attention of the stockholders was called to the fact that while he had conducted experiments in this direction at his own expense the company could not expect they would be continued unless the treasury was supplied with adequate funds with which to pay for them.

During the year 1884, owing to want of funds, no business whatever was done by the company. From the report to the stockholders, presented at the annual meeting on January 20th, 1885, it appeared that the debts referred to in the last annual report had not been paid, but that on the contrary the debts of the company then exceeded the sum of about \$5,500; that there was no money in the treasury and no way of liquidating these debts, as the only assets of the company consisted of 436 shares of its capital stock, which had so far depreciated in value that they could not be sold at any price.

The directors again urged the necessity of raising money to discharge the obligations of the company, and to enable Mr. Edison to continue his experiments mention was also made of the fact that during the year

The meeting was organized by the selection of Mr. John S. Southwick, one of the Directors of the Company as Chairman and Mr. W. S. Perry as Secretary.

The Chairman read to the Board the following

4

he had conducted a number of experiments at his own expense.

From January, 1886, until the present time no business has been done by the company, and its affairs have remained at a standstill. The company is without funds to enable Mr. Edison to continue his experiments and has no means of raising them. The few shares of stock in its treasury are practically unsalable and valueless.

When the company was organized it was thought that large profits would be at once realized from its inventions for separating magnetic iron sands, but after large expenditures it was found that while the inventions of Mr. Edison did all that was claimed for them, they were rendered of no commercial value because of a difficulty, not then anticipated, in reducing the iron after separation.

It has always been the opinion of Mr. Edison that with proper facilities for experimenting at his disposal he could invent means of separating the rebellious ores containing the precious metals. Many experiments have been conducted by him in this direction at his own expense notwithstanding the obligation on the part of the company to pay for them, as expressly provided in the contract between him and the company.

The company being without funds and Mr. Edison being unwilling and unable to pay the expenses of further experimentation the property of the company must be regarded as valueless unless some new arrangement can be made with Mr. Edison by which these experiments can be prosecuted.

After consultation with your Board of Directors he has submitted the following proposition:

The Chairman also read to the Board the following proposed plan of reorganizing the Edison Ore Milling Company, Limited, signed by the Board of Directors and sent to each of the stockholders, and also read the

5

That the capital of the company be increased from its present capital of \$350,000 to \$2,000,000.

That of such two million dollars \$925,000 in stock be issued to the present stockholders upon their surrendering the stock now held by them, thus giving to each stockholder one and a half (1 1/2) shares of stock in the reorganized company for each share now held by him.

That \$1,475,000 in stock be issued to Mr. Edison in consideration of his making a new agreement with the company, \$250,000 of which to be placed by him in the treasury of the company, to be used for developing its business.

The new contract with Mr. Edison shall provide that he will actively devote himself to experimenting upon separating the precious metals from the rebellious ores, and will assign any inventions made by him relating to the same to the company.

That he will relieve the company from its present obligation to pay him an annual salary of \$10,000 and 30% of the net profits of its business, and release it from all moneys now due him amounting to several thousand dollars.

That he will construct a special laboratory for experiments on separating ores, and will prosecute his experiments extensively, advancing therefor from his own pocket whatever moneys may be necessary up to \$25,000.

In case his experiments do not result successfully, Mr. Edison will make no claim on the company to reimburse this amount. Should he succeed, however, he will take in payment of his advances treasury stock at a value to be fixed by the Board of Directors, or cash realized from the sale of such stock.

Secretary in  
my own handwriting

The meeting was organized by the selection of Mr. John C. Tomlinson, one of the Directors of the Company, as Chairman and Mr. W. S. Perry as Secretary.

The Chairman read to the Board the following

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Your Board of Directors, after careful consideration of the subject, are convinced that the proposition submitted by Mr. Edison is eminently fair and in the interests of the stockholders should be carried out. Unless it be effected on some other plan of reorganization carried through, your Board are of the opinion that the corporation should be dissolved and its affairs liquidated.

THE BOARD OF DIRECTORS OF THE EDISON ORP  
MILLING COMPANY, LIMITED,

The Chairman also read to the Board the following proposed plan of reorganizing the Edison Orp Milling Company, Limited, signed by the Board of Directors and sent to each of the Stockholders, and also read the Secretary's report which was received

The meeting was organized by the  
selection of Mr John C. Tomlinson, one  
of the Directors of the Company, as Chair-  
man and Mr W. S. Perry as Secretary

The Chairman read to the Board  
the following

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The Chairman also read to the  
Board the following proposed plan of  
reorganizing the Edison Ore Milling  
Company, Limited, signed by the Board  
of Directors and sent to each of the  
Stockholders, and also read the  
following letter from the Secretary in  
which the notice and proxy was enclosed

The President also fairly stated the check of the meeting

The Secretary, Mr Perry presented to the meeting satisfactory proof of the mailing of the notice of the meeting, the proposed plan of reorganization, and the letter accompanying the same to every stockholder of the Company by the same being deposited in the Post Office with postage prepaid, properly addressed to each stockholder of record of the Company at his last known place of residence at least ten (10) days, before the time for holding the meeting.

Mr. James then offered the following resolution and moved its adoption

Resolved, that the Capital stock of the Edison Ice Milling Company, Limited, be increased from three hundred and fifty thousand dollars, to present Capital to two Million Dollars, and that the additional stock be divided into shares of one hundred dollars each and be issued by the officers of the Company according to the

direction of the Board of Directors

The motion was seconded by Mr Smith

The Chair appointed as tellers Messrs Peger and Randolph, and a ballot was taken, and the tellers certified, after counting the ballots, that the stockholders mentioned above and owning the number of shares mentioned, had voted in favor of the said resolution, and none against

It appearing from the whole number of votes cast, that a majority of the stockholders in number and representing more than a majority of all the stock of said Corporation had voted in favor of the adoption of said resolution, the chairman declared the same to have been adopted by the stockholders

Mr Smith offered the following resolution and moved its adoption.

Resolved, that the plan of reorganization, as contained in the printed pamphlet sent to the stockholders of the Company, be and the

same hereby is, in all respects approved by the stockholders of this Company and that the Directors of the Company be and they hereby are authorized to carry the same into effect and to it further

Resolved, that upon Mr Edison making a new contract with the Company relieving it from its obligation to pay him his annual salary of seven thousand a year and thirty per cent of the net profits of the Company monies, if earned, and from all debts now due, and upon agreeing to construct a special Laboratory for experiments on separating out and to prosecute his experiments, and devoting himself actively thereto, and upon agreeing to advance from time to time therefor and for the general expenses of the Company whatever monies may be necessary up to twenty five thousand dollars, that the Directors of the Company be and they hereby are, authorized in consideration thereof, to issue to Mr Edison

the agreement with Mr Edison to provide that he will make no claim for repayment of moneys spent in experiments or for building or equipping said Laboratory in case his experiments do not result successfully; and in case they do result successfully to accept in payment of the same treasury stock at a value to be fixed by the Board of Directors or cash realized from the sale of such stock.

Moneys advanced by him for expenses other than for experimental or patent purposes to be paid in cash or stock at a value fixed by the Board of Directors irrespective of whether his experiments result successfully or not at such time as may be convenient to the Company

The agreement with Mr Edison to further provide that he will donate to the Company two hundred and fifty thousand dollars in its stock the motion having been amended by Mr Tanner, the chairman appointed. Messrs Pelzer and Randolph as Tellers.

A ballot was taken and the tellers reported after counting the votes



that the stockholders mentioned above and owning the number of shares mentioned had voted in favor of said Resolution and none against.

It appearing that all the stockholders present at the meeting in person or by proxy had voted in favor of the resolution, the Chairman declared the same to have been unanimously adopted.

Minutes of Special Meeting  
of the Board of Trustees of The Edison  
Ice Milling Company, Limited, held at  
the Office of Mr John C. Tomlinson No  
40 Wall Street New York City on the 14th  
day of October 1887, at 11. A.M.

Present

Messrs. John C. Tomlinson  
W. J. Perry  
Frank M. Laughlin  
P. W. Smith, and  
W. H. Danner  
Trustees

The President Mr. Tomlinson in the  
Chair.

The meeting having been  
called to order, the Secretary read  
the minutes of the meeting of the  
Stockholders of the Company held on  
the 13th day of September 1887.

The President then stated that  
pursuant to the action at each  
meeting the Capital stock of the  
Company had been increased from  
three hundred and fifty thousand, to  
Two Millions Dollars.

The Secretary read to the Board

the Certificate to increasing the Capital Stock of the Company, filed in the Office of the Secretary of State September 22nd, 1887 and in the Office of the County Clerk September 23<sup>rd</sup>, 1887.

It was moved by Mr Perry seconded by Mr Garner, that a copy of such Certificate be written in the Minute book after the minutes of this meeting. The motion having been put, was carried.

The New Contract with Mr Edison having been read and discussed by the Board.

Mr Garner then offered the following resolution and moved its adoption.

Whereas a contract with Mr Edison has been prepared pursuant to the directions of the Stockholders at their meeting held on the 13<sup>th</sup> day of September 1887, therefore

Be it Resolved, that the Officers of the Company be and they hereby are directed to execute the same on behalf of the Company, and

Be it further Resolved, that the Officers of the Company be, and they

hereby are directed to cause the same to Mr Edison of 14750 shares of the Capital stock of said Company upon his executing, and in consideration of the Contract aforesaid, and

Be it further Resolved, that a copy of said contract be placed in the Minute Book of the Company immediately after the minutes of this meeting.

The motion having been duly seconded was put by the chair and unanimously carried.

The Board then adjourned.

Statement of Increase of the  
Capital Stock of the Edison Ore  
Milling Company, Limited, from Three  
hundred and fifty thousand dollars  
to Two Million dollars

We John C. Tombinas Chairman  
and W. S. Perry Secretary do hereby  
Certify

1. That a meeting of the stockholders  
of the Edison Ore Milling Company  
Limited, was held at No 40 Wall  
Street in the City of New York on the  
13<sup>th</sup> day of September 1887, pursuant  
to a printed notice of said meeting  
specifying the time and place of  
holding the same, and that the  
object thereof was to increase the Capital  
stock of the said Company from Three  
hundred and fifty thousand dollars  
to Two Million dollars, which Notice  
was deposited in the Post Office  
properly addressed to each stockholder  
of the Company at his last known  
place of residence with postage paid  
said, more than ten days prior  
to the time fixed for holding the  
same

2. That Mr John C. Tombinas a  
director of the said Company was  
duly elected Chairman and Mr  
W. S. Perry, a director of the said  
Company was duly elected Secretary  
of said Meeting

3. That a majority of the stock-  
holders of the said Company in  
number and representing a ma-  
jority of the Stock of said Corporation  
were present at said Meeting

4. That due proof of the statutory  
notice of said meeting was made

5. That the following resolution  
was offered

"Resolved that the Capital Stock of  
the Edison Ore Milling Company, Limited  
be increased from Three hundred and  
fifty thousand dollars to Two Million  
dollars, and that the additional  
Stock be divided into shares of One  
hundred dollars each and be issued  
by the Officers of the Company according  
to the direction of the Board of Directors

6. That the meeting proceeded to  
ballot said resolution. Upon counting  
the ballots it was found that Eighty  
nine ballots representing eighteen hundred

and thirty two shares were cast in favor  
of said resolution and more against.  
It appearing that more than a ma-  
jority of the stockholders of the said  
Corporation in manner had voted  
in favor of the said Resolution and  
that ballots representing more than  
a majority of the stock of said  
Corporation had been given in favor  
thereof, the chairman declared the  
same adopted.

John C. Tomlinson  
Chairman

W. L. Perry  
Secretary

Dated September 17, 1887

State of New York } ss.  
City & County of New York }

John C. Tomlinson being  
duly sworn deposes and says, that  
he was the chairman of the meeting  
referred to in the foregoing Certificate,  
that he knows the contents of the said  
Certificate, and that the statements  
contained therein are in all respects  
true.

Subscribed and sworn to

before me this 17<sup>th</sup> day of  
September 1887

John C. Tomlinson

A. W. Riddle

Commissioner of Deeds

Seal

New York Co.

State of New York }  
City & County of New York } ss.

W. L. Perry being  
duly sworn, deposes and says that he  
was the Secretary of the meeting referred  
to in the foregoing Certificate; that he  
knows the contents of the said Certificate  
and that the statements therein contained  
are in all respects true.

Subscribed and sworn to }  
before me this 17<sup>th</sup> day of } W. L. Perry  
September 1887 }

A. W. Riddle

Commissioner of Deeds

Seal

New York Co.

State of New York } ss.  
City and County of New York }

On this 17<sup>th</sup> day of  
September 1887 before me personally

Came John C. Truchsess and W. L. Perry to one known and known to one the persons described in and who executed the foregoing Certificate and they solemnly acknowledged to me that they executed the same for the purposes therein mentioned.

In witness whereof I have hereunto annexed my hand and seal the day and year first above written

Wm. H. Middle  
Comptroller of Deeds  
New York Co.

Subscribed

Certificate of Increase of the Capital  
Stock of the Edison Ore Milling Company  
Limited

Tax for promotion of organization  
of this Company  
\$ 2,523.75  
under chapter  
103 of Laws of 1896 Paid to  
State Treasurer before filing

State of New York  
Office of Secretary of State  
Filed and  
Recorded Sept. 20<sup>th</sup> 1897  
Frederick Miller  
Deputy Secretary of State

State of New York  
Office of the Secretary of State } 65

I have compared the preceding  
with the Original Certificate to Increase the  
Capital Stock of the Edison Ore Milling Company  
Limited, with affidavit and acknowledge-  
ment thereto annexed filed and recorded  
in this office on the twenty second day of  
September 1887 and I do hereby certify the  
same to be a correct transcript therefrom and  
of the whole of the said original.

I do hereunto annex my hand and the seal  
of the Secretary of State at the City of Albany  
this twenty second day of September one  
thousand eight hundred and Eighty Seven

Frederick Cook

Secretary of State

Seal

Agreement made this 14<sup>th</sup> day of October one thousand eight hundred and eighty seven Between Thomas A. Edison of Llewellyn Park in the State of New Jersey party of the first part and The Edison Ore Milling Company Limited, a Corporation organized and existing under the Laws of the State of New York and hereinafter called "the Company" party of the second part

Whereas a certain agreement was heretofore entered into between the parties hereto, bearing date the twelfth day of January one thousand eight hundred and eighty wherein and whereby the said Thomas A. Edison for the consideration and upon the terms in said agreement mentioned did assign to the said Company, each and every invention then made and each and every Letter Patent then obtained and each and every application for Letter Patent then filed by him relating or in any way pertaining to the extraction of metals from ores, tailings, gravel or deposits, whether by the use of Electricity

or of any chemical, mechanical or other process or means whatsoever, and did agree to assign to the said Company all other and further inventions discovered, improvements, processes, devices apparatus and means of the character above described, and all Letters Patent-granted thereon which he might make or obtain within the period of seventeen years from the date of said agreement and did further agree to make and prosecute with all reasonable speed and diligence from and after the execution of said agreement, investigations and experiments for discovering, devising and perfecting the best and most profitable process apparatus devices and means for extracting metals from ores, tailings, gravel and other deposits. The Company agreeing to pay all expenses incurred by the said Edison in and about his said experiments and investigations, as will more fully appear from said agreement, a copy of which is hereto annexed and marked exhibit A and

Whereas, the Company being without

funds to enable the said Edison to continue his experiments and being without facilities to raise money to meet the same, and being largely indebted to the said Edison for advances made and experiments conducted by him since the execution of the said contract, the said Edison did submit to the Board of Directors of the Company at a meeting of said Board held on the fourth day of August one thousand eight hundred and eighty seven, a proposition for the reorganization of the said Company, which proposition at a meeting of the Stockholders of the said Company duly called and held was submitted and approved, and the Directors of the said Company were authorized and directed to carry the same into effect, and to that end the Capital Stock of the Company was duly increased from three hundred and fifty thousand dollars to two million dollars.

Now these Presents Witnesseth, that the said Edison for and in consideration of fourteen thousand seven hundred

and fifty shares of the Capital Stock of the said Company for which he has subscribed at par and in full both cash and the said Company for and in consideration of one dollar not paid and each in accordance with and in execution of said proposition of reorganization do agree as follows:

First. The contract made between the parties hereto and dated the twelfth day of January one thousand eight hundred and eighty, a copy of which is hereto annexed, is in all respects, cancelled, abrogated and annulled except in so far as the same operated as an agreement, covenants then made and Letters Patent then obtained, or applied for or contracts then executed.

Second. The said Edison hereby sells and assigns to the said Company the entire and exclusive right, title and interest, use and benefit in and for the United States of America and all other states and countries of the world, in and to all inventions, discoveries, improvements, processes,

devices, apparatus and means heretofore made, discovered or used by him or in or pertaining to the extraction of metals from ore, tailings, gravel or other deposits, whether by the use of Electricity or of any chemical, mechanical or other process or means whatsoever, and in and to all Letters Patent of the United States or other countries issued or granted upon said inventions, and in and to all applications for Letters Patent of the United States or other countries now pending.

Third. The said Edison further agrees to make and prosecute with all reasonable speed and diligence from and after the execution of this agreement, investigations and experiments for discovering, devising and perfecting the best and most profitable process apparatus, devices and means for extracting metals from ore, tailings, gravel and other deposits by electricity, mechanical, chemical or such other means as he can or may discover or devise; and any and all inventions or improvements relating thereto made by him within seven years from the

date hereof, he will make known to the Directors of the party of the second part or its successors, the nature and character thereof, and will forthwith make and execute such assignments as may be necessary to transfer to the said Company the absolute title and ownership in and to said inventions for the United States and all countries of the world, and that in case the said Company shall desire to obtain Letters Patent thereon in the United States or elsewhere, he will do such acts and execute such papers as may be necessary to secure such Letters Patent and will at the same time direct such Letters Patent to be applied for to be issued directly to the said Company or such person as it may designate, and will further make special assignments of such applications and Letters Patent to the said Company. It being the intention of this agreement to convey to the said Company the absolute ownership and enjoyment for all countries of this world in and to all discoveries and inventions the said Edison may



made relating to the aforesaid, within seven years from the date hereof and to obligate him to do all and every act, and execute all and every paper which may be necessary to secure to said Company the absolute ownership, use, enjoyment and protection of said inventions in the Countries aforesaid, all costs and charges incurred or to be incurred in the procuring of said Letters Patent or in the conduct of said experiments to be met and paid by the said Company.

In case however the Company should be of opinion that it would be more to their interest not to apply for or obtain Letters Patent on any invention made by the said Edison, but to use the same as a Trade Secret, they shall have the right so to do. And the said Edison agrees to give to the said Company complete and detailed information, descriptions, formulae and instructions for practically operating and using any such inventions, and further agrees that he will not disclose the

same to any person other than to the Company without its permission in writing signed by its President.

Fourth. The said Edison hereby releases and discharges the Company from all monies and debts due him by the said Company on the 13<sup>th</sup> day of September 1887, and the Company being now without funds with which to pay its general expenses or the expenses of experiments, or of obtaining Letters Patent, the said Edison agrees to donate to the said Company 2500 shares of the Capital Stock held and owned by him to be used by the Company in such manner as it may think proper for the purpose of defraying the expenses necessary to be incurred in exploring and developing its business and further agrees that he will advance to the said Company from time to time such monies as may be necessary to meet its general expenses, to pay for the cost of experiments and for obtaining Letters Patent on inventions made by him and apportionable to the said Company and to construct a special Laboratory for the conduct and prosecution of said

experiments, Provided however, that the total sum to be so advanced by him for the construction and equipment of said Laboratory and for the payment of said expenses shall not exceed the sum of twenty five thousand dollars.

In case his experiments do not result successfully he shall make no claim on the Company to reimburse the amount so advanced by him for experimental or patent purposes, nor shall the same be in any way regarded as a debt of the Company. In case he should succeed however, in devising a practical system for the extraction of the precious metals from ores, tailings, gravel and other deposits, all monies advanced by him for the purposes aforesaid shall be repaid by the Company either in cash or at the option of the Company in its stock at a value to be fixed by the Board of Directors. All monies advanced by the said Edison for purposes other than the procurement of patents, the conduct of experiments or the construction and equipment of said Laboratory shall be paid by

the Company in cash or in its trading stock at a price to be fixed by the Board of Directors of the said Company at and only at such time as may be convenient to the said Company.

In witness whereof the parties hereto have set their hands and seals the day and year first above written

Thomas A. Edison

The Edison Co. Smelting Company Limited

by John C. Tomlinson  
President

Seal

Attest  
W. L. Perry  
Secretary

## Minutes of Special Meeting of the

Board of Directors of the Edison Ore  
Milling Co Limited Held at the office  
of Mr J C Tomlinson 40 Wall St City  
April 5<sup>th</sup> 1888

Present Messrs J C Tomlinson Robert  
L Cutting W H Perry W H Garner, P. W.  
Smith and Frank McLaughlin President  
in the Chair. Minutes of the previous  
meeting were read and approved.

Mr Tomlinson called the attention  
of the Board to a communication to the  
company under date of January 6<sup>th</sup> 1888  
from C B Eaton Esq asking payment of  
note of his claim against the company  
amounting to \$2,100.00. On motion of Mr  
Perry, seconded by Mr Cutting, the officers  
of the company were directed to execute  
a note in the name of the company to Mr  
Eaton for \$2,100.00 bearing date December  
13<sup>th</sup> 1887 and payable eighteen months  
from its date with interest at 6 percent.

Mr Tomlinson read to the Board  
a letter which he had written to Mr H. M.  
Villard giving him an option to deal  
with the company's inventions in Europe for  
a period of four months. On motion of  
Mr Cutting seconded by Mr Garner the

action of the President in giving this option  
was approved.

Mr Frank McLaughlin having  
tendered his resignation as a director of  
the company, this resignation was by  
motion accepted. Mr Perry nominated  
as his successor Mr Walter Cutting  
the nomination having been seconded  
by Mr Smith a ballot was taken and  
as a result of such ballot Mr Walter  
Cutting was unanimously elected a  
Director of the Company.

Mr Cutting moved, seconded L.  
Mr Garner that the President appoint  
two of the Board who together with  
the President should constitute an  
Executive Committee of the company. The  
motion having been put to the chair and  
unanimously carried. The President  
appointed by such Committee Mr Volcutt  
and Mr W. H. Perry.

Mr Cutting stated to the Board  
that his brother James D. Cutting who  
owned shares had died intestate  
that his heirs at law and next of kin  
were his father Mr R. Cutting and Mr  
R. Cutting Jr and Mr Walter Cutting his  
brothers. That Mr R. Cutting Sr. had dur-

ing his life time assigned all this interest in the stock to Mr. R. L. Cutting Jr. and Mr. Walter Cutting, that no letter of administration had been taken out on the estate of James D. W. Cutting and he therefore requested that the Board men of whom were familiar with the actual facts, direct the transfer of the stock standing in the name of James D. W. Cutting to Mr. R. L. Cutting and Mr. Walter Cutting, as this would avoid the necessity of taking out letters of administration and the necessary legal proceedings.

Mr. Perry then offered the following resolution and moved its adoption.

Resolved, That the Officers of this Company be and they hereby are directed to authorize the Farmers Loan and Trust Company Transfer Agents, to transfer the stock of this Company now standing in the name of James D. W. Cutting to Messrs. Robert L. Cutting and Walter Cutting.

The motion having been seconded by Mr. Smith the resolution was unanimously carried.

The Board then adjourned

W. D. Perry  
Secretary

Minutes of Special Meeting  
of the Board of Directors of  
The Edison One Milling Company Limited  
held at the office of Messrs. E. Robinson  
No 40 Wall St. Friday April 10<sup>th</sup> 1888

Present Messrs Robert L. Cutting Walter Cutting W. D. Perry, P. H. Smith and W. C. Perry. In the absence of the President the meeting was called to order by Mr. W. C. Perry Secy.

On motion by Robert L. Cutting was appointed chairman pro tempore.

The Chairman stated that the meeting was called to settle a claim of Mr. Frank McLaughlin made by him against the Company for salary as Vice-President. The Chairman further stated that an examination of the minute book of the Company showed that Mr. McLaughlin had been appointed, experienced and at the time of his appointment it was stated that his salary was to be hereafter fixed, but that such salary had never been fixed. But the Directors after consulting with Mr. Edison finally decided that it would be wise to settle this claim by the issuance to Mr. McLaughlin of one hundred shares of the treasury stock of

the Company upon his giving the Company a full receipt and discharge from all liabilities.

Mr. Garner offered the following resolution and moved its adoption.

Resolved That the officers of this Company be and they need be are directed to close and deliver to Mrs. Francis McLaughlin one hundred shares of the stock of this Company upon his executing to the Company a release of all claims against the Company for value as Superintendent or for any other purpose.

The motion having been seconded by Mrs. Smith the resolution was unanimously carried.

It was moved by Mrs. Smith and seconded by Mr. Walter Cutting that the office of Superintendent be abolished. The motion having been put was unanimously carried.

The meeting then adjourned  
W. S. Perry  
Secretary

Minutes of a special meeting of the Board of Directors of The Edison Ore Milling Co. Limited, held at No. 19 Bay St., New York, on the 23d. of October, 1888.

Present.

Messrs. W. S. Perry,  
R. D. Cutting,  
Walter Cutting,  
C. W. Smith,  
Samuel Smell.

The Secretary explained that finding it necessary to call the meeting for the purpose of electing a Vice President, owing to the absence in Europe of the President, who could sign the certificates of the stock of the Company and transact other business, he had informally consulted the Directors, and acting on their suggestion had submitted the matter to Mr. A. B. Eaton, Counselor at Law, 120 Broadway. Mr. Eaton reported to him as follows:

(copy)  
New York City, Oct. 12, 1888.  
The Edison Ore Milling Co.  
W. S. Perry, Secy.

Dear Sir:

Replying to your valued favor of the 10th

must, stating that it is absolutely necessary that certificates of stock of your Company should be signed, and that in the absence of the President there is no officer to sign them, there being no Vice President, and asking whether a meeting of the Directors can be held for the purpose of electing a Vice President, in order that the certificates may be signed and other important business may have immediate attention. I try to say that in view of the exigencies <sup>of the case</sup> it will be proper and legal for a special meeting of the Directors to be held for the purpose of electing a Vice President, and for transacting any other business that may come before them, provided that the notice or call for the meeting be signed by a majority of the Directors, and provided further that a copy of the notice of meeting be sent by mail to the address of each of the Directors at least two days before the time for holding the proposed meeting.

Awaiting your further favors, I am,

Very truly yours,

Signed, S. B. Eaton

Acting on this letter he obtained the following request to call a meeting of the Board of Directors:

New York, Oct. 12, 1888.

To Mr. H. S. Perry, Secy.,

The Edison Ore Milling Co. Ltd.

Dear Sir:

"You are hereby requested to call a meeting of the Board of Directors for the purpose of electing a Vice President, and the transaction of other necessary business."

Yours truly,

Signed,

J. A. Edison,  
Chas. Batchelor  
Saml. Spruell,  
P. W. Smith,  
Walter Cutting  
R. S. Cutting.

Mr. Perry issued a notice of meeting of which the following is a copy.

New York, Oct. 17, 1888.

"A special meeting of the Board of Directors of The Edison Ore Milling Co. Limited, will be held on Tuesday, Oct 23, at 3 P. M., at

19 Aug 88 for the consideration of such business as may be presented.

Signed, W. S. Perry.

After the above explanation Mr Robert L. Gutting was nominated to act as Chairman of the meeting.

Mr Perry proposed Mr Samuel Swett as Vice President of the Company. The Chairman nominated Messrs Perry and Smith tellers. The tellers reported that four (4) votes were cast in favor of Mr Swett as Vice President.

Mr Gutting then vacated the chair and Mr Samuel Swett presided as Vice President of the Company.

Mr Perry proposed that the Secretary be authorized to write to the Farmers Loan & Trust Co. instructing them to recognize the signature of Mr Samuel Swett as Vice President for the purpose of signing the certificates of stock of the Company, and transacting such other necessary business with them. This motion was seconded by Mr Gutting and carried unanimously.

The Secretary reported that he had a letter from Mr W. H. Garner, dated Aug. 24th, offering his resignation as a Director of the Company. On motion of Mr Walter Gutting the resignation was accepted, and the Secretary instructed to so notify Mr Garner.

On motion of Mr Perry, seconded by Mr Robert L. Gutting, Mr A. E. Bradstreet was nominated and elected to fill the vacancy in the Board of Directors created by the resignation of Mr W. H. Garner and the Secretary was instructed to notify Mr Bradstreet of this election.

On the motion of Mr Robert L. Gutting the following resolution was adopted:

Resolved, that the Executive Committee be and are hereby authorized to make such contracts as they may think proper with relations to the working of the Company's patents so far as they apply to the separation and concentration of Iron Ores, and that the officers of the Company are directed to execute such contracts as may be approved by the Executive Committee.

On motion of Mr Perry, seconded by Mr Smith, the office of the Company was moved from No. 40 Wall St. to No. 17 Bay St.

On motion the meeting adjourned.

Minutes of a Special meeting of the  
Board of Directors of The Edison Ore Milling  
Co. Limited, held at 19 Dry St. on the 14th day of  
January, 1889.

Present:

Messrs. A. G. Bradstreet,  
P. W. Smith  
Samuel Insull  
John C. Tomlinson (Pres.)  
W. S. Perry. (Secy.)

The Secretary read a report to be submitted to  
the Stockholders at their Annual Meeting, to be held  
on the 15th inst. and on motion the same was  
approved and ordered to be spread upon the minutes  
as a portion of the records.

To the Directors and Stockholders  
of The Edison Ore Milling Company, Limited.  
11th January, 1889.

"The re-organization of the Company resulted  
in renewed efforts being made by Mr. Edison  
with a view to perfecting his system for concentrat-  
ing Iron Ores. His work in this connection has  
resulted in what would appear to be complete  
success. The Officers of the Company have made  
preliminary arrangements with a Syndicate to  
operate the patents of the Company, for dealing  
with Iron Ores in Pennsylvania and New  
Jersey. The first plant is now being con-

structed and will doubtless be in operation within  
the next few months. Should this plant prove  
successful the same Syndicate will proceed to  
erect plants throughout New Jersey and Pennsylvania.

Exactly what royalty the Ore Milling Company  
will receive from the Syndicate has not yet been  
decided upon. It has been thought better to post-  
pone the final decision on this matter until such  
time as the exact economy of the Concentrating Process  
can be fully established. The arrangements under  
which the Pennsylvania and New Jersey business will  
be operated are very favorable to your Company. Inas-  
much as should the enterprise prove a failure no  
obligation whatever will be incurred by The Ore  
Milling Company, but in the event of the business  
proving a success your Company will derive bene-  
fits in the shape of royalties.

A somewhat similar arrangement has been  
made with relation to the States of Michigan, Wis-  
consin and Minnesota. A plant is now being  
erected in the Lake Superior District by a Com-  
pany recently formed in Chicago to work the patents  
in the States above mentioned.

"It has been thought desirable to await the  
results of these two initial plants, one in the Eastern  
State and the other in the Western States, before  
vigorously pushing the business in the remaining ter-  
ritory. Parties who in the first case are willing to



risk their money on a comparative uncertainty, naturally expect better terms than they would be able to obtain were the business a firmly established one, and the profits accruing from the Edison System beyond question should the two plants referred to prove a success, there is very little but that a large and lucrative business can be developed in all Magnet Iron bearing Districts.

Since these organizations Mr. Edison has devoted a great deal of time to experimental work on his system for working Rebellious Gold Ores. The success which has so far attended his efforts would seem to show that eventually he will produce a system which will successfully deal with these Ores, and consequently bring a large premium to your Company. So far, Mr. Edison has not been able to devote the whole of his time to this particular line of experimental work, but he promises in the near future to do so.

With the immediate development of the Iron Concentrating Process, and the possibility of Mr. Edison's experiments to work the Gold Process proving a success, we think that your Company has reason to take a very favorable view of its future prospects of doing a successful business.

Samuel Smell  
Vice Pres"

On motion of H. S. Perry, seconded by Mr. Samuel Smell, the following gentlemen were recommended to the Stockholders to be voted for as Directors for the ensuing year:

Thomas A. Edison  
Kalter Cutting.  
Robert L. Cutting.  
A. G. Bradstreet  
T. W. Smith.  
H. S. Perry  
Samuel Smell  
Chas. Batchelor  
H. M. Liver

Minutes of the Annual Meeting of Stockholders

of  
The Edison Ore Milling Co. Limited.  
held at the Office of the Company, 17 Day St. New  
York City, Jan. 15th, 1889, at 12 o'clock Noon, in pursuance  
of the foregoing notices:

STATE OF NEW YORK,  
City and County of New York.

THIS ANNUAL MEETING OF THE  
EDISON ORE MILLING COMPANY, LIMITED, for the  
purpose of electing Directors and Inspectors of  
the Company, was held at the Office of the Com-  
pany, 17 Day St. New York City, on the 15th day  
of January, 1889, at 12 o'clock Noon, in pursuance  
of the foregoing notices, and the following  
order of the Board of Directors.

Now Henry  
of the City of New York, being duly sworn,  
says: That he is the ~~Postmaster~~ of the EDISON ORE, a  
daily paper printed and published in the City of New York; and that the Notice of  
which the enclosed is a printed copy, has been regularly published in the said EDISON  
Ore  
C. H. C. King  
subscribed to the following order of the Board of Directors.

William Hagen

Heaven to help me, this  
of

H. C. Wood, Notary Public.  
Cert. Feb. 10, 1889.

The meeting was organized by the election of  
Mr. Samuel Insull as Chairman and W. S. Perry as  
Secretary of the meeting.

The meeting then proceeded to the election of  
two Inspectors of Election, and Messrs. Joseph Hutchinson  
and R. R. Coats were unanimously chosen as such  
Inspectors and subscribed to the following oath.

State of New York } ss.-  
City and County of New York

Joseph Hutchinson and R. R. Coats

being severally duly sworn, each for himself says: that he  
will discharge with fidelity the duties of the office of  
Inspector of Election of Directors of the Edison Ore  
Milling Company, Limited, at the Annual Meeting of  
the Stockholders, held January 15th, 1889; and that  
he will not receive any vote, but such as he believes  
to be legal, nor report any which he believes to be  
illegal.

Subscribed and sworn to  
before me this 15th day of  
January, 1889.

Joseph Hutchinson  
R. R. Coats.

Thomas C. Jensen  
Notary Public  
Kings Co. and filed N.Y.C.

The polls were then declared open at 12 o'clock  
for the reception of votes.

The following report of Vice President Insull  
was open for inspection of Stockholders:

"To the Directors and Stockholders  
of the Edison Ore Milling Company Limited.

14th January, 1889

"The re-organization of the Company resulted in  
renewed efforts being made by Mr. Edison with a view  
to perfecting his system for concentrating Iron Ore.  
His work in this connection has resulted in what

would appear to be complete success. The Officers of the Company have made preliminary arrangements with a Syndicate to operate the patents of the Company for dealing with Iron Ores, in Pennsylvania and New Jersey. The first plant is now being constructed and will doubtless be in operation within the next few months. Should this plant prove successful the same Syndicate will proceed to erect plants throughout New Jersey and Pennsylvania.

Exactly what royalty the Ore Milling Company will receive from the Syndicate has not yet been decided upon. It has been thought better to postpone the final decision on this matter until such time as the exact economy of the Concentrating Process can be fully established. The arrangements under which the Pennsylvania and New Jersey business will be operated are very favorable to your Company, inasmuch as should the enterprise prove a failure no obligation whatever will be incurred by the "Ore Milling Company," but in the event of the business proving a success, your Company will derive benefit in the shape of royalty.

A somewhat similar arrangement has been made with relation to the State of Michigan, Wisconsin and Minnesota. A plant is now being erected in the Lake Superior District by a Company recently formed in Chicago to work the patents in the States above mentioned.

"It has been thought desirable to await the results of these two initial plants, one in the Eastern States and the other in the Western States, before vigorously pushing the business in the remaining territory. Parties who in the first case are willing to risk their money on a comparative uncertainty, naturally expect better terms than they would be able to obtain were the business a firmly established one, and the profits accruing from the Edison System beyond question. Should the two plants referred to prove a success, there is very little doubt but that a large and lucrative business can be developed in all Magnetic Iron bearing Districts.

"Since the reorganization, Mr. Edison has devoted a great deal of time to experimental work on his system for working Rebellious Gold Ores. The success which has so far attended his efforts would seem to show that eventually he will produce a system which will successfully deal with these Ores, and consequently bring a large revenue to your Company. So far Mr. Edison has not been able to devote the whole of his time to this particular line of experimental work, but he promises in the near future to do so.

"With the immediate development of the Iron Concentrating Process, and the possibility of Mr. Edison's experiments to work the Gold Processes

proving a success, we think that your Company  
has reason to take a very favorable view of its  
future prospects of doing a successful business.

Signed

Samuel Insull  
Vice President

The polls were closed at one o'clock P. M. and  
Inspectors after canvassing the votes made the follow-  
ing report:

State of New York }  
City & County of New York } ss:

Joseph Hutchinson and R. R. Coats,  
the Inspectors of Election at the annual meeting  
of the Stockholders of the Edison Ore Milling Co.  
Limited held on the 15th day of January, 1889  
hereby report that there were present at such meet-  
ing, in person or by proxy, holders of Thirteen  
thousand three hundred sixty-five and one-half  
shares of the Stock of said Company; that at  
such meeting Thirteen thousand three hundred  
sixty-five and one-half votes were cast, and that  
all such votes were cast for the following  
named persons, as Directors of said Company  
for the ensuing year: Thomas A. Edison,  
Walter Cutting, Robert L. Cutting, A. C. Bradstreet,  
O. W. Smith, H. A. Amy, Samuel Insull, Charles

"Batchelor and H. M. Liver."

Dated, New York January 15th, 1889.

Joseph Hutchinson  
R. R. Coats.

There being no further business the meeting  
then adjourned

Secy of the meeting

The first meeting of the New Board of Directors of the Edison Ore Milling Company, Limited was held on Wednesday January 16th, 1889, at the Office of the Company, 4 Day St. New York.

Present: Messrs. A. H. Brown, P. H. Smith, Robert G. Cutting, Samuel Insull and W. D. Perry.

The following Officers were unanimously elected by ballot to serve for the ensuing year:

President, Robert G. Cutting,

Vice President, Samuel Insull,

Secretary, W. D. Perry, Treas. R. L. Cutting,

The following were also elected to serve on the Executive Committee for the ensuing year:

Robert G. Cutting

Samuel Insull,

W. D. Perry

On motion the meeting adjourned.

At the Quarterly Meeting of  
The Edison Ore Milling Company Limited  
Mar. 18 1889.  
there were present :-

Mr. Cutting

" Smith

" Insull

" Bradstreet and

" Perry.

Mr. Perry, calling the Meeting to order stated that as both the President and Vice-President were absent, he proposed Mr. Bradstreet as Chairman which was seconded and he was forthwith elected Chairman of the meeting.

The Chairman then called the Meeting to order :-

The Minutes of the last Meeting were read & approved.

Mr. Perry proposed the following Resolution

" That the Executive Committee be

" authorised with full power to close

" the Contract with the Pennsylvania

" New Jersey Concentrating Works."

Which was carried.

No other business being before the Meeting, the Meeting adjourned.

Notices concerning the usual Quarterly Meeting of the Board of Directors of the Edison Ore-Milling Co. Limited, were sent out for June 17th, 1889.

There being no quorum present no meeting was held.

Secretary.

Notices concerning the regular Quarterly Meeting of the Board of Directors of the Edison Ore-Milling Co. Limited, were sent out ~~concerning~~ for September 16th, 1889, at 3 P. M.

There being no quorum present no meeting was held.

Secretary.

Notices concerning the regular Quarterly Meeting of the Board of Directors of the Edison Ore-Milling Co. Limited, were sent out for December 16th, 1889.

There being no quorum present no meeting was held.

Secretary.

Minutes of the Annual Meeting  
of Stockholders  
of the

Edison Ore Milling Co., Limited,  
held at the office of the Company, 19 Dry  
St., New York City, January 21<sup>st</sup>, 1890.  
at 12 o'clock noon in pursuance of  
the following notice,

STATE OF NEW YORK, } ss:  
City and County of New York, }



*Mr. Hays* of the City of New York, being duly sworn,  
says that he is the *first* of the Evening Post, a  
daily paper printed and published in the City of New York; and that the Notice, of  
which the annexed is a printed copy, has been regularly published in the said  
Evening Post *for ten* in each week for  
annually, beginning on the *1<sup>st</sup>* day of *January* 18*90*.

*William H. Hays*

Sworn to before me, this  
of *January* 18*90*

*Notary Public, Albany, N.Y.*  
*Notary Public, N.Y.*

The meeting was organized by the  
election of Mr. W. S. Perry as Chairman  
and Mr. J. H. Cutler as Secretary.

The meeting then proceeded to the  
election of two Inspectors of Election  
and Messrs. C. F. Frazier and Joseph J. Kennedy  
were unanimously chosen as such  
Inspectors.

The Sacco were declared open at

inspector was for the reception of votes.  
The Sacco were closed at one o'clock  
P.M. and Inspectors after canvassing  
the votes made the following report:

State of New York :  
City and County of New York: ss:-

C. Frost, Jr. and Joseph J. Kennedy, the Inspectors of  
Election at the Annual Meeting of the Stockholders of the Edison  
Ore Milling Co., Limited, held on the 21st day of January, 1890,  
herby report that there were present at such meeting, in person  
or by proxy, holders of the Stock of said Company; that at such  
meeting ten thousand seven hundred forty-nine and one-half votes  
were cast for the following named persons as Directors of said  
Company to serve for the ensuing year: Walter Cutting, R.L. Cutting  
T.A. Edison, Chas. Hatchelor, S. Insull, H.M. Liver, P.W. Smith, Thomas

Butler and W.S. Perry.  
*Subscribed & sworn to before me*  
*this 21<sup>st</sup> day of January 1890,*  
*John S. Houghton*  
NOTARY PUBLIC, KING CO., N. Y.  
Certificate Filed with N. Y. County

*C. F. Frazier*  
*Joseph J. Kennedy*

There being no further business the  
meeting adjourned

*Secretary*

Minutes of a Special meeting  
of the  
Edison Co. Melling Co. Limited  
held at 24 Sullivan St. Thursday, Feb  
20th, 1890, at 12:30 P.M.

Present: Walter Greeting,  
V. L. Greeting,  
Chas. Satchwick,  
Thomas Butler,  
H. Smith, and  
A. J. Perry.

Walter Greeting in the chair.  
The meeting then proceeded to the elec-  
tion of Officers to serve for the ensuing  
year, resulting in the following persons  
being unanimously elected:

Walter Greeting, President.  
A. J. Perry, Vice President.  
V. L. Greeting, Treasurer.  
H. J. Perry, Secretary.

On motion made by H. J. Perry, duly  
seconded, the following Resolution was  
adopted:

Resolved: That the Treasurer of the Company  
issue stock held in the Treasury to pay

Mr. Edison for moneys advanced, <sup>up to 1250 Shares</sup> according  
to Agreement, dated 9 October 24th, 1887, he tak-  
ing the stock at the rate of \$20 per share.  
There being no further business the  
meeting adjourned.

Secretary.



Notices concerning a quarterly meeting  
of <sup>Board of Directors of the</sup> Edison One Milling Co., Limited,  
were sent out for March 24th 1890.

There being no quorum present no  
meeting was held.

Minutes of a regular Quarterly Meeting of the  
Edison One Milling Co., Limited, held at the office  
of R. L. Cutting, 19 William St., New York, June 16th,  
1890, at 2:45 P.M.:

Present: Messrs. Samuel Insull, R. L. Cutting,  
H. M. Eison and <sup>Edison</sup> H. S. Perry.

The meeting was called to order by Samuel Insull,  
Vice President, in the Chair.

Mr. H. S. Perry, Secretary, then read the minutes  
of a special meeting, held on the 20th of February,  
which were approved and ordered placed on the  
minutes of the Company.

I propose an agreement to be made by and  
between the Edison One Milling Co., and Thomas  
A. Edison, granting to the said Thomas A. Edison  
the sole and exclusive right and license to  
use within the Counties of Sullivan,  
Orange, Rockland, Putnam, Ulster and  
Westchester in the State of New York, and to  
license others to use within the said Counties,  
but not elsewhere, the improvements and in-  
ventions relating to our separators, now or  
hereafter owned or controlled by this Com-  
pany, was then submitted to the meeting  
by Mr. H. S. Perry, for examination by the  
Directors present, and when all of the  
Directors present had made themselves  
familiar with the terms and conditions

of the said proposed agreement, the following Resolution was offered by Mr. H. J. Perry:

Resolved, that the President and Secretary of this Company be and they hereby are authorized to execute, in the name of this Company and under its corporate seal, the proposed agreement which is submitted to this meeting, between this Company and Thomas A. Edison, granting to the said Edison the sole and exclusive right and license to use within the Counties of Sullivan, Orange, Rockland, Putnam, Ulster and Westchester, in the State of New York, and to license others to use within the said Counties, but not elsewhere, the improvements and inventions relating to <sup>the</sup> or separators, now or hereafter owned or controlled by this Company upon the terms and conditions in the said proposed agreement set forth.

Mr. Cutting seconded this Resolution, which was unanimously carried.

There being no further business the meeting adjourned.

W. J. Perry  
Secretary

Quarterly  
Meeting  
September 15<sup>th</sup>  
1890.

— Notices covering the regular Quarterly Meeting of the Board of Directors of the Edison Electric Lighting Company, Limited, were sent out for September 15<sup>th</sup> 1890.

— There being no quorum present, no meeting was held.

W. J. Perry  
Secretary

Quarterly meeting of the Board  
of Directors of the Edison Ore Milling  
Company, Limited, held at the office  
of Mr R. B. Cutting, No 19 William  
Street, New York City, on Monday  
December 15<sup>th</sup> 1890, at 3 P.M.

Present: Messrs R. B. Cutting, W. S. Perry,  
Charles Batchelor, Samuel Insull and Thomas  
Bulter.

On motion Mr. Samuel Insull was  
unanimously elected Chairman of the  
meeting.

An application having been made to the  
Secretary, by Mr. S. B. Connery for the issue  
of a new certificate for fifteen (15) shares in  
place of a certificate for ten (10) old  
shares in the stock of the Company, number  
which he stated had been lost.

It was moved by Mr. R. B. Cutting,  
seconded by Mr. Charles Batchelor, and carried

That a new Certificate for fifteen (15) new  
shares be issued to Mr. Connery on his  
furnishing security in a Bond of himself  
and two sureties to an amount of the  
par value of such shares, viz: \$1500<sup>00</sup>.

The Secretary presented a letter from Mr.  
S. B. Eaton, proposing that the Company issue to  
him one hundred and twenty nine (129) shares  
in the Capital Stock of the Company, in full  
settlement of his over due account for services  
and disbursements. After some discussion  
It was moved by Mr. R. B. Cutting, seconded  
by Mr. W. S. Perry, and:

Resolved: That the claim of S. B. Eaton,  
the Council of the Company for services and  
disbursements amounting to \$2,576<sup>50</sup>/<sub>100</sub> be  
hereby recognized and authority is hereby  
given to the Treasurer to issue 129 shares  
of the Capital Stock of the Company to said  
S. B. Eaton in full settlement of said  
claim.

The Secretary read the following  
letter:-

" New Jersey Trust, Loan and Guaranty Co.,  
Office Edison Building, Wall St.

New York, December 15<sup>th</sup> 1890

W. S. Perry, Esq., Secretary,

The Edison Ore Milling Company, Limited,  
New York, City.

Dear Sir:-

Referring to the Agreement entered into between your Company and this, dated November 18, 1889, more particularly to the Second Article thereof, whereby this Company covenanted to pay to your Company 15¢ per ton on all Concentrates separated by the latter, and referring further to the Fourth Article in the said agreement, under which this Company is to pay your Company a minimum Royalty during the year 1890 of \$2,000<sup>00</sup>/<sub>100</sub>, I am authorized by my Board to request an extension of the time for payment of Royalties until such time as the new mill, at Ogden, now rapidly approaching completion, shall be in full working order.

That there may be no misunderstanding, I am directed to say that this application is in nowise intended as one to relieve this Company of its obligations, but simply to defer them as indicated.

As I understand that your Company will shortly be holding its regular Quarterly Meeting, I beg to request that you will bring this matter before your Board, with the view of obtaining their authority to the extension of time for payment of Royalties as desired.

At the same time, I am to inform

you that this Company, (in the event of your Company granting the above concessions,) would be prepared to entertain a modification of the agreement, of November 18th, 1889, in so far as relates to the future payment of Royalties payable, as and from the first day of January, 1891, that is to say, this Company will agree to pay a Royalty of 25¢ per ton of Concentrate, in lieu of the 15¢ agreed to be paid under the Second Article of said agreement before referred to.

Yours truly,  
Thomas Sutton  
Secretary.

After considerable discussion, it was finally moved by Mr Charles Batchelor, seconded by Mr A. L. Cutting, and—

Resolved, that the Secretary be and he is hereby instructed to write to the Secretary of the New Jersey and Pennsylvania Concentrating Works, accepting the proposition contained in his letter of December 12th, 1890.

The Resolution having put to the meeting it was adopted unanimously.

The adjournment of the meeting having been called, to the fact of the distribution, by fire N. S. Hallenby's will, in Michigan, it was deemed advisable to

beyond effect a new agreement with him, in view of this, it was, upon motion:

Resolved, and the Secretary was authorized to write Mr. Edison, suggesting that as Mr. Edison had not carried out his agreement, it would not be advisable to make a new contract with him in the present spirit of the act, but, in consideration of the Company acting, and the Company are disposed to act, leniently towards him, that he consent to an advance of Royalty from 15 to 25 cents per line.

The Treasurer having reported that he had received from Mr. Thomas A. Edison, his account for experiments:

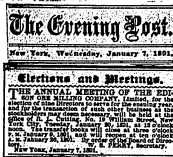
It was moved, seconded and carried, that the account of Mr. Edison, be referred to the Vice-President, and the Secretary for transmission and audit; and upon their certification of the account, the Treasurer is authorized to settle the same, by giving Mr. Edison a demand note of the Company, for the amount certified to by the Vice-President and the Secretary.

On motion the meeting adjourned.

W. Perry

Secretary.

Minutes of Annual Meeting,  
of the Stockholders,  
The Edison Ore-Milling Company, Ltd.,  
held at the office of R. L. Gilling, No. 19 Williams  
Street, New York City, Thursday, January 30<sup>th</sup>  
1891, at 12 o'clock noon, in pursuance of  
the following notice:-



The meeting was called to order by Mr. W. S. Perry, in the Chair.

Mr. Thomas Butler acted as Secretary.

The meeting then proceeded to the election of two Inspectors of Election, and Messrs. Carlos H. Howard, and Philip L. Strock, were unanimously chosen as such Inspectors.

The piles were declared open at twelve o'clock, noon for the reception of votes.

The piles were closed at one o'clock P.M., and the Inspectors after canvassing

The sales made the following report:

Election for 9 directors Edison Co. Milling  
Co. held at 19 William St Jan 20<sup>th</sup> 1891  
voters of shares voted 12678 1/2 all for  
Thomas A Edison

R. L. Cutting  
Walter Cutting  
Chas. Batchelder  
Samuel Insull  
Thomas Butler  
W. S. Perry  
H. de Silling  
P. Schultze, Secy

Carlott Woodward  
(Philpott Brook).

Insulation of  
Electric

There being no further business the meeting  
adjourned.

W. S. Perry  
Secretary.

Minutes of meeting of the newly  
elected Directors of The Edison Co. Milling  
Company, Limited. Held at the office of Mr  
R. L. Cutting, 19 William Street, New York City,  
on the 20<sup>th</sup> day of January 1891 immediately  
after the meeting of Shareholders adjourned.

Present: Messrs: Samuel Insull, R. L.  
Cutting, Thomas Butler, W. S. Perry, and  
P. Schultze, Secy.

Mr Samuel Insull in the chair.

The meeting proceeded to the election of  
officers to serve for the ensuing year,  
when the following were unanimously  
elected:

President.	Walter Cutting.
Vice-President.	Samuel Insull.
Treasurer.	R. L. Cutting.
Secretary.	W. S. Perry.

There being no other business the meeting  
adjourned. —

W. S. Perry  
Secretary.

Notices concerning the regular meeting  
of the Board of Directors of The Edison One Milling  
Company, Limited, were sent out in accordance  
with the By-Laws, for a meeting to be held at the  
office of Mr. R. L. Cutting, No. 19 William Street, on  
Wednesday the 11th day of December 1891, at the hour  
of one o'clock P.M.

There not being a quorum there was no  
meeting.

W. P. Perry  
Secretary.

Notices calling the regular  
quarterly meeting of the Board of Directors  
of The Edison One Milling Company, Limited,  
were sent out in due time in accordance with  
the By-Laws to be held at the office of Mr. R. L. Cutting,  
No. 19 William Street, New York City, on Wednesday the  
15th day of June 1891, at the hour of one o'clock P.M.

There not being a quorum there was  
no meeting.

W. P. Perry  
Secretary.

*Minutes of Annual Meeting  
of the Stockholders of  
The Edison Ore Milling Company, Inc.  
held at the office of the Company,  
Edison Building, No. 42 Broad Street,  
New York City, Tuesday, January 19<sup>th</sup> 1892,  
at 12 o'clock noon - in pursuance of  
the following notice:-*

THE EVENING POST: NEW YORK, WEDNESDAY, JANUARY 6, 1892.

**Elections and Meetings.**  
NOTICE.—THE ANNUAL MEETING OF  
THE EDISON ORE MILLING COMPANY,  
INCORPORATED IN THE STATE OF NEW YORK,  
will be held at the office of the Company,  
Edison Building, No. 42 Broad Street,  
New York City, on Tuesday, Jan. 19, at 12 o'clock  
noon. The meeting will be opened at 11 o'clock A. M.  
and will adjourn at 1 o'clock P. M.  
By order of the Board of Directors,  
W. S. PERRY, Secretary.

*The meeting was called to order by  
Mr. W. S. Perry, in the chair.*

*Mr. Harry C. Hall, noted as Secretary.*

*The meeting then proceeded to the  
election of two Inspectors of Election, and  
Messrs. Edwin J. Olmsted and Harold V.  
Smedberg were unanimously chosen as  
such Inspectors.*

*The Polls were declared open at  
12 o'clock, for the receiving of votes.*

*The Polls were declared closed at one  
o'clock P. M. and the Inspectors after  
examining the votes made the following report.*

*Election for 9 Directors of the  
Edison Ore Milling Company held at  
42 Broad St New York City, Jan. 19<sup>th</sup> 1892.*

*Total number of shares voted*

*12749 all for*

*Thomas A. Edison  
R. L. Cutting  
Waller Cutting  
Charles Batchelor  
Samuel Insell  
Thomas Butler  
W. S. Perry  
H. de Selding  
P. Schultze-Berge*

*Edwin J. Olmsted  
Harold V. Smedberg  
Inspectors of Election*



There being no further business,  
the meeting adjourned

W. L. Perry  
Secretary.

Notice calling the regular quarterly  
meeting of the Board of Directors of The  
Edison Electric Light Co. Limited, were sent  
out in due time in accordance with the  
By Laws to be held at the Company's office  
in the Edison Building, Broadway, New York,  
on Thursday the 21st day of March, 1892, at  
the hour of 1 o'clock P.M.

There not being a quorum, there was  
no meeting.

W. L. Perry  
Secretary.

There being no quorum at the  
regular quarterly meeting of the Board  
of Directors, held at the Company's  
Office, in the Edison Building, New  
York City, on Monday the 20th day of June  
1892, at one o'clock P.M., there was  
no meeting.

W. L. Perry  
Secretary.

Notice were duly sent out, calling  
the regular quarterly meeting of the  
Board of Directors, to be held at the  
Company's office in the Edison Building,  
New York City, on Monday, the 19th day  
of September, 1892.

There being no quorum, there  
was no meeting.

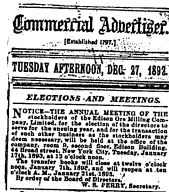
W. L. Perry  
Secretary.

Letters were duly sent out calling the regular quarterly meeting of the Board of Directors, to be held in the Edison Building, New York City, on Wednesday, the 19th day of December, 1893, at one o'clock P.M.

There being no quorum, there was no meeting.

W. S. Perry  
Secretary.

Minutes of the Annual Meeting of the Stockholders of The Edison Ore Milling Company, Limited., held at the office of the Company, Edison Building, 24 Broad Street, New York City, Tuesday, January 17th, 1893, at 12 o'clock noon in pursuance of the following notice.



The meeting was called to order by Mr. A. S. Peckham, in the chair.

Mr. W. S. Perry acted as Secretary.

The meeting then proceeded to the election of two Inspectors of Election, and Messrs. Ed. Chawsted, and A. S. Peckham were unanimously chosen as such Inspectors.

The poles were declared open at 12 o'clock for the receiving of votes.

The polls were declared closed at one o'clock  
P.M. and the Superintendents after canvassing  
the votes, made the following report:

Number of Votes Cast

Mr. Thomas A. Edison,	10,564 1/2 Shares,	by proxy from Mr. Tate.
Mr. Charles Butcher,	1,108 "	" " " " " Perry.
Mr. W. S. Perry,	276 1/2 "	" " " " " in person.
Mr. R. L. Cutting,	144 "	by proxy from Mr. Perry.
Mr. A. C. Tate,	85 "	" " " " " in person.
Mr. H. A. Felding,	34 "	" " " " " in person.
Mr. J. F. Hayes,	10 "	" " " " " in person.
Mr. A. Peckham,	20 "	" " " " " in person.

Total 12,297 Shares, for

Directors

Walter Cutting.  
Charles Butcher  
R. L. Cutting.  
W. S. Perry.  
Thomas A. Edison.  
A. C. Tate.  
Thomas Butler.  
H. A. Felding.  
P. Schultze Berg.

We certify that the above 12,297 Shares were  
voted on this seventeenth day of January, 1893.

Attest Peckham  
Edison Irving Hamilton } Inspectors of Election.

Mr. Perry presented to the meeting a statement  
of the finances of the Company for the past  
year, and it was moved and seconded that

FRONT - 29

U. S. PATENT & CO. PRINTERS  
10, NASSAU ST. N.Y.

**Know all Men by these Presents,**  
That I, Thomas A. Edison

do hereby constitute and appoint A. C. Tate or Mr. J. Perry

Attorney and Agent for me, and in my name, place and stead, to  
vote as my proxy at the annual meeting of the Edison Ore Refining  
Co. limited to be held on Tuesday, Jan 17<sup>th</sup> 1893 at 44 Broadway  
New York at 12 o'clock, P.M.  
According to the number of votes that I should be entitled to vote, if then  
personally present.

In Witness whereof, I have hereunto set my hand and seal  
this \_\_\_\_\_ day of \_\_\_\_\_ one thousand eight  
hundred and \_\_\_\_\_  
Signed and Delivered in the Presence of  
John B. Randolph

Thomas A. Edison

The polls were declared closed at one o'clock  
P.M. and the Supervisors after canvassing  
the votes, made the following report:

1  
2  
3  
4  
5  
6  
7  
8  
9  
10

We certify that the above 12,297 shares were  
voted on this seventeenth day of January, 1878.  
Alfred Becktham  
Edwin Irving Olmsted } Supervisors of Election

Mrs. Perry presented to the meeting a statement  
of the finances of the Company for the past  
year, and it was moved and seconded that

PROXY.

Grant, Schmidt, Stationer, 21 and 23 Broad St., N. Y.

**Know all Men by these Presents,**

That I, Charles Batchelor,

do hereby constitute and appoint W. S. Perry

Attorney and Agent for me, and in my name, place and stead, to vote as my proxy at <sup>the</sup> election of  
Directors and Officers of the Edison Gas Lighting Co. Ltd.  
to be held Tuesday, January 17<sup>th</sup>, 1878, at 111 Broad St. N. Y. City,  
according to the number of votes I should be entitled to vote if then personally present.

In Witness Whereof,

have hereunto set hand and seal at

the

day of

18

Signed, Sealed and Delivered in the presence of

Alfred Becktham Chas. Batchelor [S.]

The polls were declared closed at one o'clock  
P.M. and the Inspectors after canvassing  
the votes, made the following report:

Mr. Perry presented to the meeting a statement  
of the finances of the Company for the past  
year, and it was moved and seconded that

PROXY.

Conat. Schmidt, Stationer, 31 and 32 Broad St., N. Y.

**Know all Men by these Presents,**

That I, R. L. Cutting,

do hereby constitute and appoint Charles Batchelor or W. S. Perry

Attorney and Agent for me, and in my name, place and stead, to vote as my proxy at <sup>the</sup> election of  
Directors and Officers of the Edwin Orr Milling Co. Ltd.  
to be held Tuesday, January 17<sup>th</sup>, 1893, at 44 Broad St., N. Y. City.

according to the number of votes I should be entitled to vote if then personally present.

**In Witness Whereof,**

have hereunto set \_\_\_\_\_ hand and seal at

the

day of

18

Signed, Sealed and Delivered in the presence of

R. L. Cutting [L. S.]

We certify that the above 12,297 shares were  
voted on this seventeenth day of January, 1893.

Alfred Beckham

Edwin Perry Olmsted } Inspectors of Election

The polls were declared closed at one o'clock  
P.M. and the Inspectors after canvassing  
the votes, made the following report:

We certify that the above 12,297 shares were  
voted on this seventeenth day of January, 1893.  
Alfred Beckmann  
Edwin Irving Olmsted } Inspectors of Election

Mr. Perry presented to the meeting a statement  
of the finances of the Company for the past  
year, and it was moved and seconded that  
he get Mr. Cutting, the Treasurer, to send in  
an official copy of said statement, to be  
placed on record.

There being no further business, the  
meeting was adjourned.

W. S. Perry  
Secretary

Notices were duly sent out calling this regular quarterly meeting of the Board of Directors, to be held in the Edison Building, New York City, on Monday, March 20, 1893 at one o'clock P.M.

There being no quorum present there was no meeting.

W. J. Perry  
Secretary

Notices were duly sent out calling the regular quarterly meeting of the Board of Directors to be held in the Edison Building, New York City, on Monday June 19th 1893, at one o'clock P.M.

There being no quorum present there was no meeting.

W. J. Perry  
Secretary

Notices were duly sent out calling the regular quarterly meeting of the Board of Directors, to be held in the Edison Building New York City, on Monday, Sept 18th 1893 at one o'clock P.M.

There being no quorum present, the meeting was adjourned for one week until Sept 25th 1893.

W. J. Perry  
Secretary

Notices were duly sent out calling the regular quarterly meeting of the Board of Directors to be held in the Edison Building New York City, on Monday, Sept 18th 1893 at one o'clock P.M.

There being no quorum present, the meeting was adjourned for one week, until Oct. 2nd 1893.

W. J. Perry  
Secretary

The adjourned quarterly meeting of the Board of Directors was held in the Edison Building, 44 Broad St. N.Y. on Monday October 2nd 1892. The meeting proceeded to the election of Officers and resulted in the following persons being unanimously elected.

Chas. Batchelor, President.  
A. O. Tate, Vice President.  
R. L. Cutting, Treasurer.  
W. S. Perry, Secretary.

On motion made by Mr. Perry and duly seconded, the following resolution was adopted.

Resolved - That the 1600. shares of Treasury Stock be transferred to Mr. Edison at \$15 per share, the amount to be applied against the indebtedness of the Company to him consisting of open accounts to the amount of \$10,552.56; note for \$37,000.00 and interest on said note amounting to \$4,631.10.

There were present at the meeting the following named parties:-

R. L. Cutting  
Chas. Batchelor.  
A. O. Tate  
W. S. Perry

There being no further business to transact on motion, the meeting was adjourned.

W. S. Perry  
Secretary.



Notices were duly sent out  
calling the regular quarterly  
meeting of the Board of Directors  
to be held in the Edison Building  
New York City on Monday, December  
18th 1893, at one o'clock P.M.

There being no business present  
there was no meeting.

W. L. Perry  
Secretary

Minutes of the annual meeting  
of the stockholders of the Edison Ore  
Mining Co. Limited, held at the office  
of the company, Edison Building,  
111 Broadway, New York City, Tuesday  
January 16th 1894, at 12 o'clock noon  
in pursuance of the following notice

Present:

H. de Belding  
H. D. Mallory  
C. B. Carman  
Chas. Batchelor  
W. L. Perry

The Evening Post.

New York, Thursday, Jan. 4, 1894.

NOTICE.—The stockholders of the Edison Ore Mining Co. Limited are hereby notified that the annual meeting of the company will be held at the office of the company, Edison Building, 111 Broadway, New York City, on Tuesday, January 16th, at 12 o'clock noon, in pursuance of the following notice.

Mr. Perry called the meeting to order  
at 12 o'clock.

The meeting then proceeded to the  
election of two Inspectors of Election  
and Mr. Perry nominated Messrs. J. P. Walsh  
and C. J. Baldwin who were unanim-  
ously chosen.

The polls were declared open at  
12 o'clock to be open one hour for the  
purpose of electing Directors for the  
ensuing year.

Notices were duly sent

Print. Countersign all checks  
Dec 6. and 5.

Oct 23<sup>rd</sup> 1896.  
No Sig. by Lecky.

Jan'y 15. 1897. No Sig.

Jan'y 16/89. No Sig.

Mar 18/89.

June 17/89.

Sept 16/89 -

Dec 16/89.

Jan'y 21/90 - J. Parley

July 20/90. Perry

[ITEM FOUND IN BOOK]

Oct. Meeting

Directors March 25/90

Vice Presidents

July 20/90 -

Stockholders

Jan'y 21/90 -

Directors Dec 16/89 -

" Sep 16/89 -

" June 17/89

" March 18/89 -

" Jan'y 16/89 -

purpose of evening Directors for the evening year

as of the annual meeting  
the Edison Ore  
ld at the office  
Building  
in City, Tuesday  
2 o'clock noon  
following notice



meeting to order

proceeded to the  
store of Election  
as Mr. J. P. Walsh  
who were unanim.

declared open at  
one hour for the

Notices were duly sent  
calling the members

me  
to  
New  
18th

the

March 28, 1893

Financial Statement  
to Mr Perry & he was  
deputed to get an  
official statement  
from Mr Kelly Jan 17/93

JOHN G. WATSON  
ALEX. ELLIOTT, JR.,  
ATTORNEYS AT LAW,  
ROOM 210, 212 N. 10th St.,  
PITTSBURGH, P. A.

MEMORANDUM.

[ITEM FOUND IN BOOK]

as of the annual meeting  
1891 the Edison Co  
held at the office  
in Building  
in City, Tuesday  
2 o'clock noon  
following notice

LAW OFFICES  
ALEX. ELLIOTT, JR.,  
ATTORNEYS AT LAW,  
ROOM 210, 212 N. 10th St.,  
PITTSBURGH, P. A.



MEMORANDUM.

Meeting to order

proceeded to the  
stage of Election  
and Mr J. P. Walsh  
who were unanim.

declared open at  
one hour for the  
Directors for the

ensuing year

The polls were declared closed at one o'clock P.M., and the Inspectors after canvassing the votes, made the following report:-

NUMBER OF VOTES CAST :

MR. THOS. A. EDISON,	12,219 1/2	shares by proxy from Mr. Mallory
MR. CHAS. BACHELOR,	1,108	shares in person
MR. W. S. PERRY,	276 1/2	shares in person
MR. W. S. MALLORY,	280	shares in person
MR. H. L. ROGERS,	80 1/2	shares in person
MR. H. DE SELDING,	34	shares in person
MR. C. B. CARMAN,	15	shares in person

TOTAL, 14,013 1/2 shares

F O R

DIRECTORS

C. E. CARMAN  
WALTER CUTTING  
CHAS. BACHELOR  
W. S. PERRY  
T. A. EDISON  
A. O. TATE  
P. A. PHELPS JR.  
H. DE SELDING  
W. S. MALLORY

We certify that the above 14,013 1/2 shares were voted on this sixteenth day of January 1894.

INSPECTORS OF ELECTION

Jan. 16

Special meeting of the Board of Directors of the Edison Arc Lighting Company Limited, held this day.

PROXY—79

H. S. WATSON & CO., SECRETARIES  
11, AVENUE 47, NEW YORK, N. Y.

Know all Men by these Presents,

That I, Thomas A. Edison

do hereby constitute and appoint Walter D. Mallory

Attorney and Agent for me, and in my name, place and stead, to vote as my proxy at the stockholders meeting of the Edison Arc Lighting Company

according to the number of votes that I should be entitled to vote, if then personally present.

In Witness whereof, I have hereunto set my hand and seal this sixth day of January one thousand eight hundred and ninety four.

Attested and Delivered in the presence of

W. S. Mallory

Thos A Edison

ident, and the Secretary ordered to notify him of his election. Mr. W. S. Mallory said that in as much as Mr. Cutting, who had been Treasurer of this Company from the beginning has died, that he proposed that Mr.

The polls were declared closed at one o'clock P.M., and the Inspectors after canvassing the votes made the follow-

MR.  
MR.  
MR.  
MR.  
MR.  
MR.  
MR.

this sixteenth day of January 1894.

*John P. Walsh*  
*C. J. Sedgewick*

INSPECTORS OF ELECTION

page 16

Special meeting of the Board of Directors of the Edison Arc Lighting Company Limited, held this day, Present: H. De Selding, W. S. Mallory, C. B. Carman, Chas. Batchelor, W. S. Perry.

It was moved and seconded that Mr. W. S. Perry be made temporary Chairman of the meeting.

On taking the chair, he called the meeting to order, and stated that it was regular business to elect a President of the Company. It was proposed by Mr. De Selding and seconded by Mr. Carman that Mr. Batchelor be made President.

It was carried unanimously. Mr. Batchelor then took the chair and said it was in order to elect a Vice President. Mr. Mallory proposed Mr. A. O. Tate for said office. It was seconded by Mr. Perry and Mr. Tate was unanimously elected Vice President, and the Secretary ordered to notify him of his election. Mr. W. S. Mallory said that in as much as Mr. Cutting, who had been Treasurer of this Company from the beginning had died, that he proposed that Mr.

Mr. Perry, be elected Secretary and Treasurer, the two offices being filled by him, he taking the place of Mr. Cutting as Treasurer. Said Resolution was seconded by Mr. Carman, and unanimously passed.

Mr. Perry then brought up a subject that Mr. Edison had been thinking about, that in view of the depressed state of the iron business, the low prices obtained for the same, and the large amount of money that the N. J. and Penna. Concentrating Works had invested in the plant, that the royalty from the said N. J. Comp<sup>y</sup> to this Company be reduced from 25¢ per ton to 15¢. The resolution was discussed and it was finally decided to lay it over until the next quarterly meeting in March.

Mr. Batchelor suggested that in view of Mr. Cutting having been Director & Treasurer of this Company from its organization, that resolutions in relation to the sorrow felt by the Directors on account of his death

be passed, and spread on the minutes. Mr. Batchelor and Mr. Mallory were appointed to draw up said resolutions.

Whereas, the Board of Directors of the Edison Ore Milling Co. have heard with deep regret of the sudden death of their esteemed associate and friend, Mr. R. L. Cutting.

Therefore Resolved:

That we desire to place on record our high appreciation of the ability, fidelity, and integrity with which he has fulfilled the duties of Treasurer and Director of this Company from its formation. We in counsel, and prompt in action, the Company, has profited by his untiring attention to its best interests. As a merchant and friend, he has left a record and example we cannot forget.

Resolved: That a Committee of the Directors be appointed to attend the funeral, and a copy of these resolutions be sent to his bereaved family.

Mr. Perry submitted the state  
of the finances of the Company  
for the year; The Chairman proposed,  
seconded by Mr. Le Joliffe that the  
said statement be accepted and spread  
upon the minutes.

Statement  
Edison Ore Milling Co.  
Jan. 1<sup>st</sup> - 1894

Dr.	Cr.
Edison Ore 27,500.00	1893 Balance 243.50
Edison Ore 1.00	
Edison Ore 550.00	
Edison Ore 693.35	
Edison Ore 300.25	
	\$3,074.10

16 shares of stock in Treasury

There being no further business  
before the Board, Mr. Batchelor declared  
the meeting adjourned.

W. Perry  
Secretary

Statement Jan. 1 - 94  
A. J. & P. Concentrating Co.  
In account with  
Edison Ore Milling Co.

To Cash paid Byrd & S	\$ 1,085.05	July 1 - 93	By Balance	\$855.18
" " " J. B. Stet	1560.00	Apr 1 -	By Registry form	
" " " J. D. Edison	500.00	July 1 - to Mar 3, 93		
" " " J. M. Stet	400.00		736.50	200.25
" " " J. M. Stet	51.00			592.04
" " " J. M. Stet	104.60			
Balance due Edison Ore Co	\$436.70			
	\$4445.07			\$4450.17

The following Directors were present:

M. S. Leroy.

613 Carman

Mr. McCarty

The meeting being called to order, Mr. Perry proposed that we take up the matter of making a new agreement with the Neo. Jersey and Penna. Com. (Hawks

had been overruled.

Whereas, the parties hereto entered into a certain Agreement dated the 15<sup>th</sup> day of November 1889, whereby the party of the first part licensed the party of the second part to use within the State of New Jersey and Pennsylvania the improvements and inventions for separating iron ores, covered by certain patents and controlled by said party of the first part, which patents are more particularly mentioned in a former agreement, to which reference is hereby made, and for any future improvements or patents which said party of the first part may own or control in the future;

and, (Whereas, in consideration of such allowance the party of the first part



agreed to pay certain royalties to the party of the first part, namely 15<sup>cts</sup> per ton, railway weight, on each and every ton of concentrate separated by the second party, the amount of such royalty for the year ending December 31<sup>st</sup> 1890 to be paid by the second party being agreed upon at the certain guaranteed sum of at least \$2000. And, an increased amount each year thereafter, until 1894 when the amount should remain at \$10,000 for each year thereafter; And,

Whereas, the party of the second part has been delayed for various reasons in completing its proposed work, the said parties entered into a Supplementary Agreement, dated the 31<sup>st</sup> day of December 1890 by which and in consideration of the party of the first part extending the time by which the party of the second part could commence work, the party of the second part agreed to increase their royalty on each and every ton of iron ore, railway

weight, separated by them to (25<sup>cts</sup>) twenty five cents per ton, which price up to the present date has been paid.

Whereas, the party of the second part has been delayed for various reasons in completing its proposed work, and, owing to a decline in the price of iron ore, the party of the second part desires to obtain from the party of the first part, a reduction of the amount of royalty to be paid the party of the first part, to fifteen (15<sup>cts</sup>) cents per ton on each and every ton of concentrate which shall be separated as aforesaid, either by the party of the second part or its sub-licensees; and the party of the second part considers that as they have invested large sums of money in their plant in New Jersey, that such plant should be guarantee enough to party of the first part that they will continue working, and therefore wishes that all guaranteed minimum royalties now due and to become due, paid by them, abstracted out of the contract.

Now, Therefore, This Agreement  
Witnesseth:

That, in consideration of the  
premises, and in further consid-  
eration of the sum of one dollar in  
hand paid by each of the parties  
hereto to the other, it is agreed as  
follows:

The said Supplementary  
Agreement of December 31<sup>st</sup> 1890 is  
hereby amended in the following  
respects, namely, that the amount of  
royalty therein provided for be changed  
from twenty five (25<sup>cts</sup>) cents per ton to  
fifteen (15<sup>cts</sup>) cents for concentrate separated  
and the agreement of Nov. 18<sup>th</sup> 1889 is hereby  
amended in the following respect, that  
all minimum royalty now due or to  
become due be stricken out of the  
contract. It being hereby understood  
and agreed that in all other respects  
reserved except as above provided for,  
the said Agreement of November 18<sup>th</sup> 1889  
and the Supplementary Agreement of  
December 31<sup>st</sup> 1890 shall be thorough  
and binding upon the parties hereto.  
In witness, whereof, the  
parties hereto have caused their

corporate names and seals to be  
hereto affixed by their proper officers,  
thereto duly authorized.

Done at the City of New York,  
State of New York, on the day and  
year first above mentioned.

Edison Ore Milling Co. Ltd.  
By -----

Attest

Secretary -----  
W. J. and Emma Conc. Nov. 18<sup>th</sup> 1889  
By -----

Attest

Secretary -----

There being no further business  
before the Board, the meeting adjourned.

W. L. Perry  
Secretary

Notices were duly sent out  
calling the regular Quarterly Meeting  
of the Board of Directors of this  
Company to be held in the Edison  
Building, New York City on Monday  
June 18<sup>th</sup> 1894 at one o'clock P.M.

There being no quorum present  
there was no meeting.

W. L. Perry

Treasurer.

Notices were duly sent out  
calling the Regular Quarterly Meeting  
of the Board of Directors of this  
Company, to be held in the Edison  
Building, New York City, on Monday  
Sept. 17<sup>th</sup> 1894 at one o'clock P.M.

There being no quorum present  
there was no meeting.

W. L. Perry  
Secretary

Minutes of the Annual Meeting  
of the Stockholders of the Edison Ore  
Mining Company Limited, held at the  
office of the Company, Edison Building  
111 Broad Street N.Y. City on Tuesday  
January 15 1895 at 12 o'clock noon in  
pursuance of the following notice

THE MAIL AND EXPRESS.  
Broadway & St. Paul's Churchyard,  
New York.

Thursday Evening, Jan. 11, 1895.

NOTICE.

The annual Meeting of the stockholders of the  
Edison Ore Mining Company Limited is hereby  
called for the purpose of electing two Inspectors  
of Election. The meeting will be held at the  
office of the Company, Edison Building, 111  
Broad Street, New York City, on Tuesday, Jan-  
uary 15, 1895, at 12 o'clock noon. The stock-  
holders are hereby notified that the meeting  
will be held at the place and time above  
stated, and that the meeting will be held at  
the place and time above stated, and that the  
meeting will be held at the place and time  
above stated.

The meeting was called to order, <sup>by Mr. Bachelor</sup> and  
proceeded to the election of two Inspectors  
of Election. Mr. Bachelor nominated Mr.  
C. Irving Olmsted, and C. P. Baldwin, who  
were chosen unanimously.

The polls were then declared open  
for one hour for the purpose of electing  
Directors for the ensuing year.

At one o'clock the polls were closed  
and the votes being canvassed by the  
Inspectors showed the following result:-

Know all Men by these Presents,

That I, W. S. Mallory

do hereby constitute and appoint *W. S. Mallory*

Attorney and Agent for me, and in my name, place and stead, to vote at my proxy at the election of  
the Edison Ore Mining Company,

Directors

Limited.

according to the number of votes I should be entitled to vote if then personally present.

In Witness Whereof,

the 14<sup>th</sup> day of January 1895

have hereunto set my hand and seal at

Signed, Sealed and delivered in the presence of

*John A. Russell, Jr.*

[L.S.]

*W. S. Mallory*

Return of Instructions

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C. Dr  
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Inspe. .... known the following result :-

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## Know all Men by these Presents,

That L. Thomas A. Edison,

do hereby constitute and appoint

W. S. Perry

Attorney and Agent for me and in my name, place and stead, to vote as my proxy at any election of Directors of the Edison Ors Miller Corp. Inc. Limited.

according to the number of votes I should be entitled to vote if then personally present.

In Witness Whereof,

have hereto set

hand and seal at

the ELIZABETH, N. J., January 1895

Signed, Sealed and Delivered in the presence of

Royal E. Lindsey

Thomas Edison

[L. S.]

Report of Inspectors

# *Report of Inspectors.*

## NUMBER OF VOTES CAST :

Chas. Batchelor,	1108 shares	in person
W.S. Perry,	147 1/2 "	in person
T.A. Edison,	12,119 1/2 "	by proxy Mr. Perry
W.S. Mallory,	648 "	by " "
Wm. Holzer,	118 1/2 "	in person
Samuel Noyes	1/2 "	in person
Walter Cutting	164 "	in person
P.R. Upton,	418 1/2 "	in person
H. De Selding	32 "	in person

Total --- 14,758 1/2 "

## For the following Directors

C. B. CARMAN	CHAS. BATCHELOR
WALTER CUTTING	W. S. PERRY
T. A. EDISON	R. N. DYER
F. R. UPTON	H. DE SELDING
	W. S. MALLORY

We certify that the above 14,758 1/2 shares were voted on this 15th day of January 1895.

*Edwin Irving Olmsted*  
Inspectors of  
*Chas. J. Batchelor*  
Election.

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C.  
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Inspectors showed the following result :-*

W. H. R. W.  
Secretary

44	June 1st. Annual Meeting	1.50	44	June 1st. Balance	843.67
	July Cash paid N. B. City	238.15		June 1st. June amt	
	July Cash - Stationery & Encls	24.25		Dec 31 633 10 Cents	105.57
	August Cash to Sub. Com. - 4 yrs	500.00			
	June 15. Balance due E. & M. E.	155.26			
		402.13			155.10

Minutes of the adjourned meeting  
of the Stockholders  
— of the —

Edison (The) Milling Company, Limited  
held at the office of the Company on Thursday  
May, 28 - 1896 at 12 o'clock M, in pursuance  
of the following notice.

# THE MAIL AND EXPRESS.

NEW YORK, THURSDAY EVENING, MAY 14, 1896

THE ADJOURNED ANNUAL MEETING OF THE STOCKHOLDERS OF THE EDISON ORN MILLING COMPANY, L. MITCHELL, for the election of Directors, to adjourn next year, and for the transaction of such other business as the stockholders deem necessary, will be held at the office of W. R. Perry, 44 Broad Street, New York, on Thursday, May 25th, at 12 o'clock M. Transcripts of the same will close at 12 M., May 18th, and reopen on Friday, May 25th. By order of the Board of Directors.

W. B. PERRY,  
Secretary

The meeting was organized by the election of Mr. Lehar Batchelor as chairman and Mr. H. S. Perry as Secretary.

Upon motion duly seconded, Mr R. E. Gridley and Mr E. J. Olmsted, were appointed inspectors of election.

The polls were then declared open for one hour for the purpose of electing Directors for the ensuing year.

At one o'clock. P.M. the polls were closed and after counting the votes each the Tellers reported that 14027 votes had been cast for the following gentlemen as Directors for the ensuing year.

Thomas A. Edison.

Water. Cutting.

Charles Batchelor

**Know all Men by these Presents,**

That I Mrs. A. Edin.

Dr. S. Maclary

I do hereby constitute and appoint Wm. S. Mendenhall Attorney and Agent for me and in my name place and stead to vote against proxy at your meeting for the meeting of Shackleton of Edison Ore meeting for demanded, to be held May 28-1896 of any adjournment thereof.

according to the number of votes I should be entitled to cast if then personally present.

In witness whereof, I have hereunto set my hand and seal this fourth day of May / one thousand eight hundred and ninety six.

Scaled and delivered in the presence of

John F. Randolph

the election  
meeting adjourned.

Secretary

Mr. S. Mallory

Dr. S. Mallory.

We certify that the above 14027 shares were voted  
 on May 28, 1896.  
 Edwin H. Knustel } Inspector of  
 R. E. Gridley. } Elections.



Minutes of 18  
of the

Edison

held at the of  
May 28-1896 at  
of the following

THE MAI  
NEW YORK T

1896

+fixaaE

The meeting  
of Mr Chas Batchel  
Perry as Secretary  
Upon motion  
and Mr E. J. (Edison)  
of election.

The polls were  
for the purpose of a  
year.

At one o'clock. P.

after counting the  
that 14027 votes had been cast for the following  
gentlemen as Directors for the ensuing year.

Thomas A. Edison.

Walter Cutting.

Charles Batchelor.

That I, John J. Randolph,

W. S. Mallory

do hereby constitute and appoint  
Attorney and Agent to appear in my name, place and stead as my proxy at any  
meeting of the stockholders of the Edison Electric Light Co.  
to be held on May 28-1896.

according to the number of votes I should be entitled to cast if then personally present.

In witness whereof, I have hereunto set my hand and seal this 27th day of May 1896.

Sealed and delivered in the presence of  
John J. Randolph  
Alexander Smith Jr.

by election  
setting adjourned.

Secretary.

W. S. Mallory.

W. S. Mallory.

We certify that the above 14027 shares were voted  
on May 28-1896-  
Edison Electric Light Co. } Inspectors of  
R. E. Bradley } Election.

Minutes of  
the

Edison

held at the of  
May 28-1896 at  
of the following

**THE MAI**  
NEW YORK, T

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NEW  
YORK,  
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The meeting  
of Mr. Chas. Batchelor  
Perry as Secretary  
Upon motion  
and Mr. E. J. Collins  
of election.

The polls were  
for the purpose of a  
year.

At one o'clock, P.  
after counting the  
that 14027 votes had been cast for the following  
gentlemen as Directors for the ensuing year.

Thomas A. Edison.

Walter Cutting.

Charles Batchelor.

Dr. S. Perry.

A. H. Dyer.

H. De Selding.

J. B. Randolph.

Dr. E. Edmon.

Dr. S. Mallory.

And they were declared unanimously elected.  
There being no further business the meeting adjourned.

Secretary.

Number of Votes cast.

Dr. S. Perry	122 1/2	Shares in person.
Thos. A. Edison	12094 1/2	" by proxy Dr. S. Mallory.
Dr. S. Mallory	623	" in person.
H. De Selding	34	" " "
Chas. Batchelor	1133	" " "
J. B. Randolph	20	" by proxy Dr. S. Mallory.
Total	14027	Shares

For the following Directors

Thos. A. Edison.	Walter Cutting
Chas. Batchelor.	Dr. S. Perry
A. H. Dyer	H. De Selding
J. B. Randolph	Dr. E. Edmon

Dr. S. Mallory.

We certify that the above 14027 shares were voted  
on May 28-1896.

Edwin H. Christal } Inspectors of  
W. E. Bradley } Elections.

Minutes of the Meeting of the Board of Directors  
- of the -

Edison Ore Milling Company, Limited,

held at the office of the Company, 111 Broad Street New York, on Thursday May 28, 1896 at one o'clock P. M.

Present: Messrs E. C. Batchelor, Dr. S. Perry, Dr. S. Mallory, Dr. E. Gilmore, J. B. Randolph and H. De Selding, a majority of the Board.

The meeting was organized by the election of Mr. Batchelor as chairman and J. B. Randolph as Secretary. Mr. De Selding nominated Mr. Thos. A. Edison as President for the ensuing year which was seconded by Mr. Gilmore and a vote having been taken Mr. Edison was unanimously elected, President.

Mr. De Selding nominated Mr. Dr. S. Mallory as Vice President for the ensuing year which was seconded by Mr. Gilmore a vote having been taken Mr. Mallory was unanimously elected Vice President.

Mr. De Selding nominated Mr. J. B. Randolph as Secretary and Treasurer for the ensuing year which was seconded by Mr. Gilmore, a vote having been taken Mr. Randolph was unanimously elected Secretary and Treasurer.

Mr. W. S. Mallory then took the chair. Mr. Batchelor then offered the following resolutions. Resolved, that the office of this Company be removed from 44 Broad Street New York to 110 Park 23<sup>rd</sup> Street

New York. This was seconded by Mr. Dr. E. Gilmore and unanimously carried.

Mr. Batchelor offered the following resolutions:

Resolved, that the Treasurer be instructed that after proper search, if the books of the Company cannot be found, he is to purchase and open a new set of books. This was seconded by Mr. Gilmore and unanimously carried.

Mr. Batchelor then offered the following resolutions. Resolved, that the Treasurer be instructed to repay Mr. Dr. S. Perry at the rate of \$20<sup>00</sup> per month for rent of the office at 111 Broad Street New York from Sept. 1, 1895 to June 1, 1896, this was seconded by Mr. Gilmore and unanimously carried.

There being no further business the meeting adjourned.

J. B. Randolph,  
Secretary

Minutes of the Annual Meeting of the Stockholders  
— of the —

Edison Ore Smelting Company, Limited

Held at the office of the Company 110 Bask 23rd Street  
New York City on Tuesday January 19. 1897 at twelve o'clock  
M. in pursuance of the following notice.

**The Evening Post.**

New York, Wednesday, Jan. 6, 1897.

NOTICE.—THE ANNUAL MEETING OF THE STOCKHOLDERS OF THE EDISON ORE SMELTING COMPANY, LIMITED, FOR THE YEAR ENDING DECEMBER 31, 1896, WILL BE HELD AT THE OFFICE OF THE COMPANY, 110 BASK STREET, 23RD STREET, NEW YORK CITY, ON TUESDAY, JANUARY 19, 1897, AT TWELVE O'CLOCK, M. P. The business to be transacted at the meeting will consist of the election of directors and officers for the ensuing year, and the adoption of the report of the directors and the dividend for the year ending December 31, 1896. The meeting will close at 12 M. The stockholders are requested to bring with them to the meeting their certificates of stock, and to be prepared to vote. A. P. HANFORD, Secretary.

Mr. H. S. Mallory the Vice President in the chair.  
Upon motion duly seconded Mr. J. P. Kelsey and Mr.  
W. A. Connolly were appointed tellers of election.

The polls were then declared open for one hour for  
the election of nine directors to serve for the ensuing year.

The Treasurers then read the following statement  
showing the condition of the Company on January 1-1897  
as follows:

Accounts Payable

Taxes State of New York	\$751.55 1
Thomas A. Edison	2087.73 1
Dyer and Driscoll	1696.33 1
Cahoon and Lewis	850.00 1
Farmer Loan and Trust Co.	400.00 1
H. J. and Emma Carr Mober	131.68 1
New York Concentrating Works	15.00 1

\$8932.29

Notes Payable

\$32873.81  
41,806.10

2-  
61/  
28.78

50.18

31.68  
40.54

made useful  
of the Books  
valuing May 21-1896  
has immediately

one more of one person having written and tellers reported  
that 12,737 votes had been cash out of a total of 20,000  
shares and that the following persons were unanimously

Minutes of the Annual Meeting of the Stockholders  
of +1.

Rev.  
Mr. M.

Mr. M.  
the  
shown  
as f

Taxes  
From  
Dyer  
Edwin  
Taxes

Mr. J. and Emma C. C. C. C.  
New York Concentrating Works

To the Chairman of a meeting of the  
Stockholders of the Edison Ore Melling Co.  
Limited,  
and  
Report of  
as follows of the election of nine  
Directors by the Stockholders of the Edison  
Ore Melling Co. Ltd. held at the office of  
the Company, 110 East 23rd Street, New York  
on the nineteenth day of January 1897 from  
12 o'clock M. to One o'clock P. M.

We certify that the hour of 1 P. M. having  
arrived we have counted the votes cast at  
the above election and hereby declare the  
total number of votes cast was 12737  
out of a total of 20000 shares and that  
the following persons were elected un-  
animously:

Thomas A. Edison  
Chas. B. Bickel  
A. H. Rogers  
J. R. Randolph  
W. S. Mallory  
Walter C. Atting  
W. S. Perry  
H. De Sading  
W. E. Kinnor

We have our hands and seals this  
nineteenth day of January one thousand  
eight hundred and ninety seven

J. R. Kinnor  
W. S. Mallory

131.68 /  
15.00

\$932.29

Notes Payable

32873.81  
41,806.10

he.  
6.  
28.98

250.15

31.68  
40.54

made careful  
of the Book  
setting May 22-1896  
as immediately.

The hour of one o'clock having arrived the tellers reported  
that 12737 votes had been cast out of a total of 20000  
shares and that the following persons were unanimously

Minutes of the Annual Meeting of the Stockholders

has  
in  
the  
Chairman of a meeting of the  
Stockholders of the Edison Ore Refining Co.

was  
by  
the  
Chairman  
of  
the  
Edison Ore Refining Co.

has  
in  
the  
Chairman of a meeting of the  
Stockholders of the Edison Ore Refining Co.

131.68

15.00

\$8932.29

Notes Payable

Thomas A. Edman	27,509.46	
Sub from Oct 1-93 to Jan 1-97	5,364.85	\$ 32,873.81
Total		\$ 41,806.10

Edison Ore Refining Co., Ltd  
In Account with

H. J. and Emma Concentrating Works

10%		6%
Balance April 1, 1895		\$ 28.98
Royalty from Jan 1, 1895 to Jan 1, 97		
at 15¢ per ton as per contract		
1867 tons 17 bush		250.15
40.00	Cash paid S. B. Steele	
260.00	Office rent May 95 to June 96	
59.29	H. J. & E. J. Davis	
20.00	H. J. and Emma	
61.55	Expenses, etc. May 95 to	
	Balance due H. J. and Emma	131.68
\$ 440.84		\$ 440.54

The Treasurer then reported that he had made careful search and had been unable to find any trace of the Books for this Company, and that as requested at meeting May 22, 1896 he would purchase and open a new set of books immediately. The hour of one o'clock having arrived the latter reported that 12,737 votes had been cast out of a total of 20,000 shares and that the following persons were unanimously

Minutes of Annual Meeting

electd directors for the ensuing year

Thomas A. Edison.

Chas. Batchelor

P. H. Ryer

J. D. Randolph

Walter Cutting

W. S. Perry

A. De Selding

W. E. Winne

W. S. Mallory

Upon motion duly seconded the meeting adjourned.

J. D. Randolph

Secretary.

Minutes of the Annual Meeting of the Board of Directors  
—of the—

Edison Ore Smelting Company, Limited

Held at the office of the Company 110 East 23<sup>rd</sup> Street  
New York City on Tuesday January 19<sup>th</sup> 1897 at one thirty o'clock  
P.M.

Present Messrs Mallory and Randolph.  
There being no quorum present the meeting adjourned and  
the following officers held over.

Thomas A. Edison.

President

W. S. Mallory

Vice President

J. D. Randolph

Secretary & Treasurer.

John D. Randolph  
Secretary.

Minutes of the Annual Meeting of the Stockholders  
— of the —

Edison Arc Lighting Company, Limited

Held at the office of the Company 110 East 23<sup>rd</sup> Street  
New York City on Tuesday January 18<sup>th</sup> 1898 at three o'clock  
P.M. in pursuance of the following notice.

**The Evening Post**

New York, Wednesday, Jan. 20, 1898.  
**Elections and Meetings.**

NOTICE.—THE ANNUAL MEETING OF THE STOCKHOLDERS OF THE EDISON ARC LIGHTING COMPANY, LIMITED, FOR THE PURPOSE OF ELECTING DIRECTORS AND OFFICERS, AND OF PASSING UPON THE ACCOUNTS OF THE PREVIOUS YEAR, WILL BE HELD AT THE OFFICE OF THE COMPANY, 110 EAST 23<sup>RD</sup> STREET, NEW YORK CITY, ON TUESDAY, JANUARY 18<sup>TH</sup>, 1898, AT THREE O'CLOCK P.M. The business of the meeting will be transacted in English. By order of the Board of Directors, J. D. Randolph, Secretary.

Mr W. S. Maeloy the Vice President in the Chair.  
The polls were then declared open one hour for the  
election of nine directors to serve for the ensuing year.  
The hour of four o'clock P.M. having arrived the  
tellers reported that 12,737 out of a total 20,000 shares  
had been voted and that the following persons  
were elected directors thereby.

Thos. A. Edison

Chas. Batchelor

R. H. Wynn

J. D. Randolph

W. S. Maeloy.

Ernest Cutting

W. S. Conroy

H. De Belding

W. E. Kimrose

There being no further business the meeting adjourned  
J. D. Randolph  
Secretary.

Minutes of the Annual Meeting of the Board of Directors  
— of the —

Edison Arc Lighting Co., Limited

Held at the Office of the Company 110 East 23<sup>rd</sup> Street  
New York City on Tuesday January 18<sup>th</sup> 1898 at four-thirty  
P.M.

Present: Messrs Maeloy and Randolph

There being no quorum present the meeting adjourned and the  
following officers held over

Thomas A. Edison

W. S. Maeloy

J. D. Randolph

President

Vice President

Treasurer and Secretary.

J. D. Randolph

Secretary.





to J<sup>rs</sup> Penn<sup>a</sup> Conc. Works Jan'y 1-1900  
 To Edison Ore Smelting Co Ltd D.R.

Agreement on Concentration 2<sup>nd</sup> Brigette from Jan'y 1-1899  
 to Jan'y 1-1900.

1897	Dec	12	One Ash	
	Nov	11	1 - .06	
	"	17	1 - .07	
	"	29	4 - 10	
	Dec	3	2 - 03	
	"	3	8 -	17 - 6
1898	Feb	15	126 - 09	
	"	21	8 -	
	"	26	10 -	
	Aug	16	1 - 03	
	"	22	264 - 01	
	Sept	9	1 -	
	Nov	3	765 - 10	
	"	12	355 - 03	
	"	12	28 - 03	
	"	21	- 01	
	"	21	55 - 10	
	"	21	571 - 14	
	"	30	297 - 15	
	"	30	506 -	
	Dec	12	146 - 11	
	"	12	203 - 06	
	"	20	378 - 05	
	"	20	490 - 06	
	"	22	20 - 08	4163 4
1899	"	31	21 - 19	
March	"	8	10	2 - 3
May	"	15	1 - 18	4182 Four 18 Ash
			4182 1/2 Four ash 15% Ten -	\$ 627. 43

The hour of four o'clock P.M. having arrived the tellers reported that 14878 votes had been cast out of a total of 20000 shares and the following gentlemen were unanimously elected Directors for the ensuing year, Wm A. Edison, W. S. Mallory, H. De Loring Chap. Batchelor, A. H. Dyer, W. S. Perry, J. B. Randolph

Walter Cutting and Dr. E. H. Emerson.

There being no further business the meeting adjourned.

J. B. Randolph  
 Secretary.

Minutes of the Annual Meeting of the Board of Directors  
of the  
Edison Ore Drilling Company, Ltd.

Held at the office of the Company, 135 Fifth Avenue New York City on Tuesday January 16- 1900 at 4.10 P.M.

Present: Messrs Thos A. Edison, W. S. Mallory, R. B. Weyer, W. E. Kilmer, W. S. Perry, H. De Seeding, Chas. Batchelor and J. B. Randolph.

The meeting was organized by the election of Mr Edison as Chairman.

On motion of Mr Perry seconded by Mr De Seeding Mr Edison was elected President for the ensuing year.

On motion of Mr Perry seconded by Mr De Seeding Mr Mallory was elected Vice President for the ensuing year.

On motion of Mr Perry seconded by Mr De Seeding Mr Randolph was elected Treasurer and Secretary for the ensuing year.

Mr Edison stated to the Board that the present contract between this Company and himself is not a workable contract and he wished to simplify and make certain the arrangement between himself and the Company by making a new contract a draft of which he presented. Whereupon Mr Edison retired from the meeting and the Vice President Mr Mallory took the chair. A discussion of the proposed contract was then had.

It was moved by Mr De Seeding seconded by Mr

Perry that the officers be authorized and directed to execute the proposed new contract with Mr Edison.

The motion being put it was carried unanimously. On motion the Secretary was directed to spread the new contract on the minutes of the Company.

Resolutions & Agreements made this \_\_\_\_\_ day of January 1900 between the Edison Ore Drilling Company, Limited by incorporation in the State of New York, hereinafter called the Company, party of the first part and Thos A. Edison party of the second part.

Witnesseth that on January 12th 1880 and October 11th 1887 and whereas by said agreement of October 11th 1887 it was agreed that the said Edison should advance a sum not exceeding twenty-five thousand dollars (\$25,000) for expenses incurred in the erection of the Company in devising a practical system for the extraction of the precious metals from ore, tailings, gravel and other deposits, and in procuring patents on the same; and whereas by said agreement of October 11th 1887 it was further provided that in case the experiment of the said Edison did not result successfully, he the said Edison should make no claim on the Company to reimburse the amount so advanced by him, and if said experiment were successful the money advanced by said Edison to said Company should be repaid to him by said Company.

And whereas the said Edison did advance, or caused to be advanced, the said sum of twenty-five thousand dollars (\$25,000) in pursuance of said expenses without bringing said

experiments to a successful termination and without succeeding in deriving a practical system for the extraction of the precious metals from ore, tailings, gravel or other deposits, but the said Edison continued to advance, and to induce others than the Company to advance money for carrying on said experiments and procuring said patents until a large sum over and beyond said sum of twenty-five thousand dollars (\$25,000) have been advanced and expended for that purpose, and the said Edison believes that he is about to attain success in said experiments in the direction of the extraction of the gold from dry blower gold bearing deposits, and whereas the interests of the Company in the successful result of the said experiments and in the patents based thereon is in doubt, and in view of the desire of the parties to make that interest certain:-

Now Therefore, in consideration of the foregoing premises and of the sum of one dollar by each party to the other paid, it is agreed as follows:-

1. The said agreements of January 12th 1888 and October 21st 1889 are hereby cancelled, and all rights or interests of the Company in or to the inventions and patents of the said Edison, except as hereinafter provided, hereby revert to the said Edison. The Company will execute an assignment to the said Edison of all patents and applications for patents of which the Company may now hold the legal title.

2. The parties hereby mutually release each other from all obligations under said contracts and from any and

all claims for damages for any and all breaches thereof; and further, the said Edison hereby releases the Company from all claims or demands for any damages by him to the Company, and for services rendered by him to it or for its or its agents, and it is understood and agreed that the Company does not by this agreement assign to said Edison its interests in all certain license agreements made between the Company and Ben Joseph and Pennsylvania Concentrating Works dated November 13, 1889 and modified by subsequent agreements dated December 31st 1890 and 1st Feb. 19th 1891

covering the use of the inventions of said Edison for the purpose of separating iron ore in the State of Pennsylvania and Parkersburg, nor the interests in a certain license agreement made between the Company and said Edison dated May 31, 1890 covering the use of the inventions of the said Edison for the purpose of separating iron ore in the Counties of Sullivan, Grant, Rockland, Putnam, Rector and Webster in the State of New York; the said Edison hereby ratifies said two license agreements and confers the authority of the Company to make the said two agreements and to others.

The Company, however, hereby warrants and agrees that should it be requested to do so by either or both of the licensees under said license agreements, it will consent to the following modification of either or both of said license agreements, to wit: that the weight payable by said licensees shall be ten cents per ton of gross weight railroads weight or all concentrate shipped when the net selling price for the said iron ore is above

at six cents a ton per unit of Schell's iron; seven cents per ton of iron when the net selling price of iron is more than six cents and not more than seven cents per unit of Schell's iron; eight cents per ton of iron when the net selling price of iron is more than seven cents and not more than eight cents per unit of Schell's iron; and fifteen cents per ton of iron when the net selling price of iron is more than eight cents per unit of Schell's iron; and that it is understood that said figures shall not be altered except by a vote of a majority of the shareholders of the Company.

4. The said Edm. having recently perfected a process and apparatus for working the dry placer gold deposit known as the Ory Mine Grant located in Laramie County, New Mexico, and having entered into a contract relating thereto with the Baker Company, a corporation of the State of Maine (a copy of which contract is hereto annexed, marked Schell's A), the said Edm. covenants for himself and legal representative, to pay to the Company one-half of the net amounts received by him or his legal representative (over and above all expenses) from the designing, erecting and operating of the mill or mills for working said placer deposit under said contract or under any extension, enlargement or modification thereof.

5. The said Edm. further covenants for himself and his legal representative to pay to the Company one-half

of the net proceeds over and above all expenses received by him or his legal representative during each year from the date of the beginning of the designing, erecting and operating of the mill or mills for working said placer deposit in the United States or Canada which may be operated in substantially the same manner as the mill now in experimental operation in the State of the Ory Mine County, and if during said period of eight years any mill or mills shall be erected by

him or his legal representative under a contract by which he or his legal representative have an interest in the profits arising from the operation of the same, then and in that case one-half of the net amounts over and above all expenses received from such operation by said Edm. or his legal representative, after the expiration of said period of eight years shall be paid to the Company.

6. It is understood that the Company shall not be liable for any expenses or losses incurred by the said Edm. or his legal representative in designing, erecting or operating the mill or mills referred to in the foregoing preceding section of this agreement except in case he or his legal representative shall have in the design of the same a patent or patents and the preceding section.

7. In carrying out the intention of the said Edm. in the operation of the mills referred to in the foregoing preceding section of this agreement or in carrying out the intention of the said Edm. in the operation of the mills referred to in the foregoing preceding section of this agreement, it is understood that such losses or expenses may be deducted by said Edm. or his legal representative as

expense before dividing said net amounts with the Company hereunder it being understood that only the net amounts actually realized by said Edison or his legal representative shall be divided hereunder.

#### Schedule A.

Whereas, The New Mexico Mining Company, a corporation organized under the laws of the United States owner of a certain tract or parcel of land in the County of Santa Fe in the Territory of New Mexico known as the 10th and 11th Grant which was confirmed to the New Mexico Mining Company by the Government of the United States by an Act of Congress approved March 18th 1881 entitled "An Act to confirm a certain private land claim in the Territory of New Mexico" and by Letters Patent thereto issued out of and from the General Land Office of the United States and bearing date the 28th day of May A.D. 1876.

And Whereas, By an indenture of lease dated the 14th day of July 1897 a copy of which is hereto annexed and made between the New Mexico Mining Company of the one part and James M. Perry of the other part of the State of New York under and in consideration of the said lease mentioned reserved and contained in the back of the said Perry to be paid by and performed the said New Mexico Mining Company granted and conveyed to the said Perry the right of entering in and upon the premises the said 10th

Grant for the purpose of seeking for minerals and fossil substances and appropriating the same to his own use and conducting mining and quarrying operations in any manner and to any extent he may deem advisable and to lease, demise and to farm let unto the said Perry for any other purposes whatever, all the lands of the said 10th Mine Grant as owned by the New Mexico Mining Company.

And Whereas, By an Indenture of Agreement dated the 30th day of August 1897, a copy of which is hereto annexed between the said James M. Perry of the one part, and the Galisteo Company, a corporation organized under the laws of the State of Maine of the other part, the said James M. Perry did sell, grant, convey, assign, transfer and set over unto the said Galisteo Company, the said certain Indenture of Lease bearing date the 14th day of July 1897 and made and executed as aforesaid by the said New Mexico Mining Company together with all and singular the premises therein mentioned and described.

#### Now Therefore

Witness these newly made true with day of February 1898, between the Galisteo Company, a corporation organized under the laws of the State of Maine, part of the one part, and Thomas Aldrich of the State of Essex and State of New York part of the second part.

Witnesseth

That the parties hereto of the first part of the second part have communicated and agreed to and with each other as follows:

First: That the part of the second part hereinafter called the "first part" is to make out the plan and design of process for working auriferous gravel upon said grant without the use of water under a pressure of 10000 lbs. capacity per day of twenty said can be successful operation.

Second: That the part of the first part will erect upon said lot a mine plant of a certain point as may be designated by the part of the second part, and experimental trial consisting of such mine and machinery as may be designated by the part of the second part and according to the specifications furnished by him for the purpose of excavating, conveying, handling and treating auriferous gravel upon said grant, and pay all the expenses of putting the same said mine to be erected and in operation by July 1st 1898, or as soon after as possible in view of the engagements of said "first part" the total expenditures not to exceed the sum of Fifteen Thousand Dollars.

Third: That in the event that the parties hereto are mutually satisfied with the result of the mine and machinery, the parties of the first part are to authorize the preparation of plans for the construction of a large mill and the opening of the mine and use

to provide the necessary funds to pay for the same, the expenditure not to exceed the sum of Three Hundred Thousand Dollars, but the large mill shall not be erected until the above mentioned lease of the City Mine Grant to James H. Ross, assigned as aforesaid to the part of the first part is extended and perpetuated as herein provided.

Fourth: That the part of the second part will prepare plans and specifications for the said mine and machinery and by competent engineers or personally will superintend the erection and operation of same and that at any time hereinafter the said part of the second part shall make or discover any improvement in the process or invention herein provided for or in using the same, or which can or may be applied to the same or shall become the owner of any such improvement, or shall discover any new process of working auriferous gravel upon said grants then and in every such case the said part of the second part shall communicate the same to the part of the first part, and as the said part of the first part, the said part of the second part will apply the said improvement or discovery to the working of auriferous gravel upon said grant, if desired by part of the first part and the said part of the first part shall be entitled to use said practice and improvement when and the part of the second part will do so and perfect in view of to be erected and perfected all such other improvements, machinery and things to mine and improve



and during the term of the first part of the first part on said mine which

suffer. That the manufacturing of the said mine shall be sufficient to pay to the party of the first part 20% interest on the cash actually invested in the said mine and in the necessary expenses

used in the same; said interest shall be paid and paid yearly before the disbursement of the profits herein after agreed upon. That the said mine after being in successful operation shall be operated by means of skilled responsible persons for a term of 20 years, the time of non-operation shall be deducted from the year term which profits are calculated. It is further provided that the party of the second part shall receive as compensation for his skill and labor superintendence and management, 20% percent of the actual net profits or surplus remaining after the actual and necessary cost of labor and supplies in the mine and mine on the said mine and the 20% provided for in the fifth section of this agreement have been subtracted. Such net profits or surplus shall be determined yearly by a public and sworn accountant.

Further that in case of the death of the said party of the second part after no more will have been in actual operation and earning the said 20% the share proportion of the said 20% shall be reduced to no more

to the legal heirs of the party of the second part. In witness whereof the party of the first part has caused these presents to be signed by its President and the party of the second part has hereto set his hand the day and year first above written.

(Seal)

attest

H. K. Woodgate

Secy

Witness: Comptroller

by Henry P. High

President

Thomas A. Edwards

On motion the President was requested to call a Special Meeting of the stockholders to ratify the action of the Directors.

Mr. Edwards then returned to the meeting and there being no further business the meeting adjourned.

J. P. Randolph

Secretary



Minutes of a special meeting of the Stockholders  
of the

Edison Ore Milling Co. Limited

Held at the office of the Company, 135 Fifth Avenue,  
New York on Monday, February 5, 1900 at three o'clock  
P. M. notice having been mailed to each stockholder  
of record to their last known address.

In the absence of the President Mr. Masterson the  
Vice President took the Chair.

The Chair stated that the meeting was called  
for the purpose of ratifying the action of the Board  
of Directors in making a new agreement with Mr.  
Edison and he also explained the agreement to the  
stockholders present at the meeting.

Mr. A. M. Myers then offered the following resolution  
and moved its adoption. Resolved that the action of the  
Board of Directors in making an agreement with Mr. Edison to ratify  
the motion was seconded by Mr. Myers.  
Upon motion duly seconded Messrs. J. H. Fisher and G. E.  
Randolph were appointed Tellers.

The polls were declared open at 3.20 P. M.  
The hour of 4.20 P. M. having arrived the Tellers  
reported that 1788 1/2 votes had been cast in favor of  
the Resolution and none against it and it was  
unanimously carried.

Upon motion duly seconded the meeting adjourned  
J. H. Randolph  
Secretary

Minutes of a Special Meeting of the Stockholders  
of the ...

*Handwritten initials and signature*

*Handwritten signature: Thomas A. Edison*

THOMAS A. EDISON,  
PRESIDENT.

W. S. MALLORY,  
VICE-PRESIDENT.

J. F. BARTOLINI,  
SECRETARY AND TREASURER.

*Edison One Million Co., Limited*

135 FIFTH AVENUE,  
NEW YORK.

January 24th, 1900.

A special meeting of the stockholders will  
be held at this office, 3 p. m. on January 24th,  
1900, to notify the action of the directors in  
making a new agreement with Mr. Thomas A.  
Edison.

If you will not be able to attend the meet-  
ing in person, please sign and return the en-  
closed proxy, which will not be used if you  
should attend the meeting.

Very truly yours,

Thomas A. Edison,  
President.

*Handwritten note: 1000 PR 37*

Know all Men by these Presents, That I

do hereby constitute and appoint W. S. Melroy, or J. E. Randolph, attorney and agent for me, and in my name, place and stead, to vote as my proxy at the special meeting of the stockholders on February 5th, 1900, of the Edison Ore Milling Co., Limited, according to the number of votes I should be entitled to vote if then personally present.

In witness whereof \_\_\_\_\_ have hereunto set  
hand and seal at \_\_\_\_\_ the \_\_\_\_\_  
day of \_\_\_\_\_ 1900.

Signed, Sealed and Delivered in the presence of \_\_\_\_\_ [L.S.]

Minutes of a Special Meeting of the Stockholders  
of the \_\_\_\_\_  
\_\_\_\_\_ 1900.

W. S. Melroy  
Attorney for Edison Ore Milling Co. (L.S.)

To the Chairman of a Special Meeting of the Stockholders  
of the Nelson Dry Milling Company, Limited.

Report of the M. Procter and G. E. Davidson

As follows of a Special Meeting of the Stockholders of the Nelson  
Dry Milling Company, Limited, held at the office of the Company  
185 Fifth Avenue, New York, on Monday February 5th, 1900, from  
3.30 P.M. to 4.30 P.M. We hereto certify that the hour  
of 4.30 P.M. having arrived, we have counted the votes cast at  
the above election, and hereby declare the total number of votes  
cast was 77,587 1/2 shares, out of a total of 90,000 shares. Of the  
shares voted 77,587 1/2 shares were cast in favor of the resolu-  
tion to ratify the action of the Directors in making a new agree-  
ment with Mr. Nelson, and 70 shares were cast against the  
resolution.

Witness our hands and seals this fifth day of  
February, one thousand nine hundred.

Witness,

J. Henry Davidson J. M. Procter  
G. E. Davidson

Given to the  
this 5th day of February, 1900  
J. Henry Davidson  
J. M. Procter  
G. E. Davidson  
1900.

Minutes of a Special Meeting of the Stockholders  
of the Nelson Dry Milling Company, Limited.

Minutes of a special Meeting of the Stockholders  
 of the - . . . .

135 Fifth Avenue  
 at three o'clock  
 each stockholder

Mr. Masterson the

was called  
 of the Board  
 with Mrs  
 present to the

moving resolution  
 action of the  
 signed to that effect  
 every  
 siders and G. B.

220 P. M.  
 the Sellers  
 in favor of  
 and the work

being approved

secretary

[ITEM FOUND IN BOOK]

H. D. J. 32

C. B. S. 15

N. J. P. 276 1/2

H. D. J. 80 1/2

Chas. B. 1108

Walling 280

Edison 12219 1/2

14013 1/2

No. of votes cast

**Edison Telephone Company of Europe, Ltd. Records**

The Edison Telephone Company of Europe, Ltd. was organized in New York City in May 1879 to exploit Edison's telephone patents in continental Europe. Among the records of this company is a minute book for the period May 1879-April 1881. The minutes pertain to contracts, patents, stock, and other matters brought before the Board of Directors. Included with the minutes are articles of incorporation, by-laws, resolutions, agreements, and lists of stockholders. Included also are copies of letters to Charles Nottebank, Theodore Puskas, and patent solicitors Brewer & Jensen. The book is unpaginated. Approximately 60 pages have been used.

Two additional items have not been filmed: (1) a stock certificate book for 1880 containing twelve filled-in certificates; and (2) a stock transfer book for 1880 containing ten filled-in certificates.

(An original certificate, of which the following is a copy, was filed in the Office of the Secretary of State of the State of New York, at Albany, on the 3<sup>d</sup> day of May, A.D. 1870.)

State of New York }  
City and County of New York } ss:

"Mr. Thomas A. Edison, of Menlo Park in the State of New Jersey; Robert L. Gutting, a citizen and resident of the City and State of New York; Samuel S. White, of Philadelphia in the State of Pennsylvania; Robert L. Gutting Jr., a citizen and resident of the City and State of New York; and James H. Barker, a citizen and resident of the City and State of New York,

do hereby certify that we propose to form a corporation under the provisions of an Act of the Legislature of the State of New York, entitled "An Act to provide for the organization and regulation of certain business corporations," passed June 24, 1895, and the acts amendatory thereof; such corporation to be of the class of limited liability companies provided by the 33<sup>d</sup> section of said Act of June 24, 1895, and, accordingly, in pursuance of the provisions of the Act aforesaid, we do further certify as follows, to wit:

First. The name of the proposed corporation, is The Edison Telephone Company of Europe, Limited.

Second. The object for which the proposed corporation is to be formed and the nature of its business are respectively the purchasing, owning, using and procuring to be used in Europe and elsewhere, inventions in or relating to speaking telephones, the procuring and owning of letters patent of the Governments of Europe for such inventions; the selling of such letters patent or of interests therein, or of rights to use the inventions covered thereby; and the doing of such other business as is incidental to the object and business aforesaid.

And, the locality of the business of the proposed corporation will be partly in this country, and especially in the City and State of New York, and partly in Europe.

Third. The capital stock of the proposed corporation will be one hundred thousand dollars.

Fourth. The number of shares of which such capital

stock shall consist is one thousand of the par value of one hundred dollars each.

Fifth. The location of the principal business office of the proposed corporation will be the City of New York in the State of New York.

Sixth. The duration of the proposed corporation will be twenty years.

Thomas A. Edison  
R. L. Cutting  
Samuel S. White  
R. L. Cutting Jr.  
James H. Banker

City and County of New York ss.

On this second day of May in the year 1899, before me personally appeared Thomas A. Edison, Robert L. Cutting, Samuel S. White, Robert L. Cutting Jr. and James H. Banker, to me known to be the individuals described in and who executed the foregoing certificate, and the said R. L. Cutting, R. L. Cutting Jr. and James H. Banker, being known to me to be severally citizens and residents of the State of New York, and they severally signed said certificate before me and acknowledged to me that they signed the same and for the purposes therein mentioned.

Chas. Roth (28)

(L.S.)

Notary Public  
New York County



And Thursday and on said 3<sup>rd</sup> day of May,  
the Secretary of State issued a license to the parties  
making such certificate - in the following form, to wit:

N<sup>o</sup> 2

### License

State of New York

Office of the Secretary of State } ss

Whereas, an application for the formation of a  
corporation in the class of limited liability, under the  
corporation laws of "The Edison Telephone Company of Europe,  
Limited," pursuant to the provisions of Chapter 611, laws  
of 1879, entitled "An Act to provide for the organization  
and regulation of certain business corporations," was filed  
in this office on the third day of May 1879.

I therefore license and appoint Thomas A. Edison,  
N. S. Cutting, Samuel L. White, R. L. Cutting Jr. and  
James H. Banker, Commissioners to open books for sub-  
scriptions to the capital stock of such corporation,  
agreeably to the requirements of the said act.

Witness my hand and the Seal of Office of  
the Secretary of State, at the City of Albany,  
this third day of May, 1879.

Geo. Moss

Deputy Secretary of State

And in virtue and by authority of said license and  
agreeably to the requirements of the act therein referred  
to, the said Commissioners have opened this book for  
subscriptions to the capital stock of "The Edison Tele-  
phone Company of Europe, Limited," on this  
day of May, 1879, at

The subscribers names are below written hereby severally sub-  
scribed for and agree to take the number of shares of the  
capital stock of The Edison Telephone Company of Europe  
Limited which are set opposite our respective names in  
the following

### List of Subscribers

to the Capital Stock of the Edison Telephone Company of Europe, Limited

Names	Residence	Number of Shares
Thomas A. Edison Samuel L. White	Monk Park N.Y. Philadelphia	250. 83
J. F. Bailey, James H. Banker	Park's France New York	83 28
R. L. Cutting Jr. R. L. Cutting Jr.	New York New York	28- 28 500

And we, the commissioners above named, hereby certify that, at the time of making their respective subscriptions above named, each of the said subscribers paid to us, the commissioners, in cash, ten per cent. of the face value of each share subscribed for by him.

On the said 7<sup>th</sup> day of May, 1879, it appearing that at least one half of the capital stock of the Edison Telephone Company of New York, Limited, had been duly subscribed, the said commissioners called a meeting of the said subscribers for the purpose of adopting by-laws for said corporation and of electing directors thereof.

Said meeting was called by depositing a notice in the Post Office in the City of New York addressed to each and every subscriber at his last known place of residence, and with the proper postage thereon prepaid, at least five days previous to the date appointed for said meeting, which notice was in the form set forth in the verified report hereinafter appearing.

At the time and place named in said notice, to wit: on the 13<sup>th</sup> day of May, 1879, at 19 William Street in the City of New York, at three o'clock in the afternoon, subscribers to the number of five, and representing in person or by proxy

five hundred shares of the capital stock, appeared and organized by choosing Mr. Samuel S. White chairman, and Mr. Robert E. Cutting Jr. Secretary of the meeting.

And it was then so motion unanimously Resolved, That the following are hereby adopted as the by-laws of this corporation:

### By-Laws

-7-

### The Edison Telephone Company of New York, Limited

#### Article I. Directors

Section 1. The property and business of the Company shall be managed, and its affairs shall be regulated by a Board of five Directors.

Section 2. The term of office of the Directors shall be one year.

Section 3. Where any vacancy shall occur among the Directors by death, resignation or otherwise, it shall be filled for the remainder of the year by a vote of a majority of the remaining directors.

Section 4. The Directors shall hold regular quarterly meetings in the first Wednesday of May, August, November and February in each year.

Section 5. Special meetings of the Directors may be called by the President at his discretion, and shall be called by him to be held three days after written request to that effect delivered to him, setting forth the object of the proposed meeting, and signed by any two directors; and notice of such meeting and

of such effect thing, shall be delivered to each director, except to his address by mail, in either case ten days before the time of the proposed meeting.

Section 1. The Directors shall have power to appoint such agent and other employees of the Company as they shall deem necessary, and prescribe their duties.

Section 2. The Directors shall designate three of their number as an Executive and Finance Committee, which Committee shall have and exercise the powers of the Directors in the intervals between the meetings.

#### Article 6. Executive and Finance Committee.

Section 1. Regular meetings of the Executive and Finance Committee shall be held on the first Monday of January and each other odd month thereafter in each year, and special meetings may be called at any other time by the President, or by either member of the Committee, or given ten days notice, hereinafter, a quorum of such action to each member of the Committee.

Section 2. The members of the Committee together with the President shall be a quorum for the transaction of business.

Section 3. The Committee shall keep minutes of all their proceedings, which shall be read from time to time at the next following meetings of the Board of Directors.

#### Article 3. Auditing Committee.

At each regular quarterly meeting of the Board of Directors they shall appoint one or more of their number a Committee to examine the stock books, accounts, vouchers and securities of

the Company, and to report the result thereof to the Directors at their next regular quarterly meeting.

#### Article 4. Stockholders.

Section 1. The annual meeting of the Stockholders shall be held at noon of the 1st day of May in each year, at the office of the Company in the City of New York.

Section 2. At each common meeting of the Stockholders the Board of Directors shall make a report of the business, profits and affairs of the Company for the preceding year; the duties of the Directors shall be made by ballot; and such other business shall be transacted as the Stockholders shall deem necessary.

Section 3. Two inspectors of election shall be appointed at each annual meeting to elect a quorum at each meeting. Said electors, who shall be receiving money as regulated by law, and their names and count the votes and shall certify in writing to the meeting the names of the persons elected directors.

Section 4. At the annual meeting the polls shall be kept open one hour unless all the votes are received sooner.

Section 5. Special meetings of the stockholders may be called by order of the President in his discretion, and shall be called by him to be held within fifteen days upon a written request so to be delivered to him, signed either by a majority of the Directors or by Stockholders owning one third or more of the Capital Stock of the Company, and within a period of notice of such special meeting stating the object of it.

shall be sent to such stockholder whose address can be learned by the Secretary ten days before the day of the meeting.

Section 1. Two thirds in interest of the Stockholders shall attend either in person or by proxy, at every meeting, to constitute a quorum.

### Article 5. Officers.

Section 1. The officers of the Company shall be a President, Vice President, Secretary and Treasurer.

Section 2. The directors shall meet for the election of such officers and for the transaction of business, without unnecessary delay, after the annual election.

Section 3. The President and Vice President shall be elected separately by ballot by the directors from among their number, and the persons securing the vote of a majority of the Directors of the Company shall be voted and be such officers respectively.

Section 4. The Secretary and Treasurer may be appointed by a vote of a majority of the Directors.

Section 5. The salaries of the officers shall be fixed by the Directors.

Section 6. The President shall be the chief executive officer of the Company, he shall preside at all meetings of the Directors, and of the Executive and Finance Committee, he shall sign all certificates of stock, and all contracts on behalf of the Company, he shall countersign all checks drawn by the Treasurer, and shall perform such other duties as are incidental to his office. He shall be, ex officio, a member of the Executive and Finance Committee, and he shall prepare a report for the annual meeting of the Stockholders which shall be submitted to the Directors for

their approval.

Section 7. The Vice President, during the absence or inability of the President, shall preside at the meetings of the Directors and of the Executive and Finance Committee, and shall in all other respects possess and exercise the power and perform the duties of the President.

Section 8. The Secretary shall give notice of all meetings and shall keep the minutes of the proceedings of the meetings of the Stockholders and of the Directors and of the Executive and Finance Committee. He shall have custody of the stock books and shall countersign all certificates of stock and to represent in the correct issuing and cancellation of the same; he shall keep the corporate seal, and when authorized by the Directors shall affix the same to contracts, and shall perform such other duties as the Directors may prescribe. At the annual meeting of the Stockholders he shall submit a full statement of the business of the Company for the preceding year.

Section 9. The Treasurer shall receive and have charge of all funds of the Company; he shall deposit the same to the credit of the Company in such bank or banks as the Directors shall designate, and he shall deliver therefrom in any sum the Directors may direct, he shall give bond in the sum of twenty five hundred dollars, with two sufficient sureties, being freeholders within the County of New York, for the faithful discharge of his duties. He shall sign all checks for the payment of money, which shall also be countersigned by the President or Vice President. He shall keep regular books of account, showing all his receipts and disbursements, and all the business of the Com-

same, which shall be at all times then to be reported of annual directors of the Company, and he shall report the condition of the Treasury at each regular meeting of the Board of Directors, and at the annual meeting he shall make a report in writing to the President showing the financial condition of the Company.

Section 4. When any vacancy shall occur among the officers of the Company, it shall, nevertheless, be deemed, it shall be filled in the same way as is provided in this article, for the election is absent of each officer.

#### Article 6. Stock and Certificates of Stock.

Section 1. The subscriptions to the stock of the Company shall be paid to the Company in installments of not less than three at the time of subscription and the rest at a later time as determined by the Board.

Section 2. No person to pay when due any installment of the sum subscribed for stock of the Company the stock so subscribed shall be registered together with all prior payments made on account of the subscription thereof.

Section 3. Certificates of stock in the form required by law shall be maintained and bound in books, and when issued shall be registered for in the margin, and no certificate shall be signed or sealed in blank.

Section 4. No transfer of stock shall be valid unless made on the books of the Company or surrender of the old certificate, which shall be cancelled and passed by the Secretary in the book at the place where it was issued.

Section 5. The stock transfer books may be closed by order of the

Directors for the purpose of declaring a dividend after holding an annual election but for no longer time than twenty days at one time.

#### Article 7. Corporate Seal.

The corporate seal of the Company shall bear the corporate name in a circle around the center.

#### Article 8. By-Laws.

These by-laws may be altered, amended, repealed or new by laws may be added at any regular meeting of the directors by vote of a majority of all the directors, provided written notice of the specific alteration, amendment, repeal or addition proposed to be made has been given at a previous regular meeting of the Board, or such alteration, amendment, repeal or addition may be made at a special meeting of the Directors of which ever written notice as aforesaid has been given a day to each director at least thirty days before such special meeting.

The meeting then proceeded to the election of five directors to manage the affairs of the Company for the first year.

The Chairman appointed Messrs. John Gilling, Charles H. Howard and George Howard, inspectors of each election.

And upon a canvas by such inspectors it was found that five votes representing five hundred shares of the capital stock

has two cents of interest each of the following persons account  
for 1840-1841: Thomas A. Colver, Samuel's wife, Robert  
Cuttings, hotel, J. Cuttings & Co. and James H. Parker, living  
on the same east; whenever said persons were detained debt,  
detested, and a certificate of court is proper to that effect was  
therein made. & thus is witness

State of New York

*"It is hereby verified that an original certificate for the payment of a subscription in the class of limited liability subscriptions, under the corporate name of The Eastern Telephone Company of New York, numbered one three one of the office of the Secretary of State, under telephone no. four of 1878, entitled 'an act to provide for the organization and regulation of certain business corporations', on the third day of May, 1890, and that the following is a true and correct copy of said original certificate (the same having been compared with said original) and of the whole thereof:—*

both on a low  $\beta$  and on a high  $\beta$ .

Next The name of the proposed organization is The Eastern and Western Conference of Europe. Similar:

And the locality of the business of the proposed corporation will be  
practically in this country, and especially in the City and State of

New York, and partly in Europe.

Third The Capital Stock of the proposed corporation will be one hundred thousand dollars.

Fourth The number of shares of which such capital stock shall consist is one thousand, of the par value of one hundred dollars each.

Fifth The location of the principal business office of the proposed corporation will be the City of New York in the State of New York.

Sixth The duration of the proposed corporation will be twenty years.

Thomas A. Edison

R. L. Greeting

Samuel S. White

R. L. Greeting Jr.

James H. Banker

City & County of New York ss

On this second day of May in the year 1879, before me personally appeared Thomas A. Edison, Robert L. Greeting, Samuel S. White, Robert L. Greeting Jr., and James H. Banker, to me known to be the individuals described in and who executed the foregoing Certificate, and the said R. L. Greeting, R. L. Greeting Jr., and James H. Banker, being known to me to be legally citizens and residents of the State of New York, and they mutually signed said certificate before me and acknowledged to me that they signed the same and for the purposes therein mentioned.

(s. s.)

Noted & attested at New York City, New York County  
Evident: Dated May 3 1879.

And it is further hereby certified, that upon the filing of said Certificate of which the foregoing is a true and correct copy, on the third day of May, 1879, as aforesaid, a license was issued by the Secretary of State, pursuant to said Act, to the five persons named in and who made and acknowledged said certificate, empowering them as commissioners, to open books for subscriptions to the Capital Stock of said proposed corporation, at such times and places as they might determine.

And a verified record of the proceedings of said commissioners, having this fourth day of May, 1879, been filed in the office of the Secretary of State, containing a copy of the subscription list to the capital stock of said proposed corporation, together with a copy of the By-Laws for said proposed corporation, adopted by the subscribers to said Capital stock, at a meeting of said subscribers held at No. 19 William Street in the City of New York on the twelfth day of May, 1879, pursuant to the provisions of said Act, as appears from said verified record aforesaid, at which subscribers' meeting as aforesaid, five directors, (being the number provided for in the said By-Laws of said proposed corporation) were also chosen, whose names, as further appears from said verified record of proceedings filed as aforesaid, are as follows, to wit:

Thomas A. Edison

Robert L. Greeting

Samuel S. White

Robert L. Greeting Jr. and

James H. Banker.

New York, J. George Mads, Deputy Secretary of State,

do hereby certify that said corporation, to wit: The Edison Telephone Company of Europe Limited, is fully organized in accordance with said act, Chapter 611, Laws of 1879, and that all the provisions of said act have been duly observed in the organization of said corporation as hereinafter set forth.

Witness my hand and the seal of office of the Secretary of State, at the City of Albany, this 11<sup>th</sup> day of May, 1879

( Seal )

E. C. Moss

Deputy Secretary of State

and said certificate having been duly recorded in the office of the Secretary of State, on the 17<sup>th</sup> day of May, 1879, a copy thereof was also filed and recorded as required by law in the office of the Clerk of the City and County of New York, in Book of Incorporations Vol. No. 1, at page 554, that being the County in which the principal business office of said Company is situated - on the 17<sup>th</sup> day of May, 1879.

The verified report above referred to, filed in the office of the Secretary of State on the 11<sup>th</sup> day of June, 1879, was in the following form.

Commissioner's Report

Verified record of proceedings (in Section 7 Chapter 611, Laws of 1879.)

State of New York  
City and County of New York } ss:

We, the undersigned, duly appointed and empowered

by the Secretary of State of the State of New York, by license bearing date of the third day of May, A.D. 1879, Commissioner to open books for subscriptions to the capital stock of a limited liability company to be known under the corporate name of "The Edison Telephone Company of Europe Limited," hereby report in conformity therewith:

That on the seventh day of May, A.D. 1879, at the office of Robert S. Bentley, Jr., at No 19 William St., in the City of New York, we opened books for subscriptions to the capital stock of such company.

That a correct book is a true copy of the list of subscriptions to the said capital stock, which list is marked "Booklet A," and is hereby made a part of this record.

That at the time of making such subscription, each subscriber paid to us in cash ten per cent. of the par value of each and every share subscribed for by him.

That on the seventh day of May, A.D. 1879, it appearing that at least one-half of the capital stock of the said "The Edison Telephone Company of Europe Limited" had been duly subscribed in accordance with the requirements of Act 5 of the aforesaid act, we called a meeting of the subscribers for the purpose of adopting By laws for said corporation, and of electing directors thereof.

That such meeting was called by depositing a notice in the Post Office, addressed to each and every subscriber at his last known place of residence, and with the proper postage thereon prepaid, at least five days previous to the time appointed for said meeting, as appears by the copy of said notice, and the accompanying





"Exhibit 1" referred to in the foregoing report

New York, June 1, 1878

Sir,

A meeting of the subscribers to the Capital Stock of "The Western Telephone Company of New York, Limited," was held at the office of Robert L. Gutting, Jr., at 217 No. 10th Street in the City of New York, on Monday, the 28th June, 1878, at 3 o'clock in the afternoon, for the election of five men for said corporation, and the election of Robert L. Gutting, Jr. to manage the concerns of the said Company for the first year.

Thomas A. Edison  
Robert L. Gutting, Jr.  
Samuel S. White  
Robert L. Gutting, Jr.  
James H. Barker  
Commissioners

State of New York

City and County of New York } ss.

Francis Jordan, being duly sworn, deposes and says that he is upwards of six teen years of age; and that on the seventh day of May, A.D. 1878, he observed in the Post Office in the City of New York, printed copies of the above notice, each notice having been first securely enclosed in an envelope, and said envelope having been respectively addressed to — Thomas A. Edison, at New York, New Jersey; Samuel

S. White, at Philadelphia, Pennsylvania; Joshua H. Barker, at New Haven, Robert L. Gutting, Robert L. Gutting, Jr., and James H. Barker, each at the City of New York; and also a printed copy of the same notice, securely enclosed in an envelope and addressed to Joshua H. Barker, at the Carter House in the City of New York, that place being the present temporary residence of said Barker; and persons having access to, subscribers to the Capital Stock of "The Western Telephone Company of New York, Limited," and the places also named being their respective last known places of residence, and the before postage on each of said envelopes having been prepaid by depositors before the mailing thereof as above is known to believe this.

1st day of May, A.D. 1878  
Chas. Roth (Sw)

Notary Public

New York County.

"Exhibit 2" referred to in the foregoing report

State of New York

City and County of New York } ss.

Mr. Walter L. Gutting, Charles H. Howard, and George Howard, the Engineers for the first annual election of "The Western Telephone Company of New York, Limited," being severally duly sworn, do depose and say, and each for himself deposes and says.

That, at each election held at the office of

Robert L. Cutting Jr. of No. 19, William Street in the City of New York, on the 12<sup>th</sup> day of May, A.D. 1879, the following named stockholders were elected Directors to manage the affairs of the said company for the first year of its existence, each Director having received the number of votes set forth opposite his name, to wit:

Thomas J. Nelson received five votes.

Robert L. Cutting received five votes.

James J. White received five votes.

Robert L. Cutting Jr. received five votes.

James H. Banker received five votes.

W. L. Cutting

Charles B. Howard

George Howard

Attest to the foregoing }  
12<sup>th</sup> day of May, A.D. 1879 }  
(witness) Charles Roth (12)

Attesty further

at N. Y.

Secretary of meeting

At a Meeting of the Directors of the Company, held at No. 19 William Street in the City of New York, on the 15<sup>th</sup> day of May, 1879, all of said Directors except Mr. White being then present - by unanimous vote of the Directors then present, by ballot, - James J. White was elected President and James H. Banker was elected Vice-President; and, by unanimous vote of all said Directors, Robert L. Cutting Jr. was appointed Secretary and Treasurer of the Company.

And, at the same time, the said Directors designated James H. Banker, Robert L. Cutting Jr., and as an Executive and Finance Committee.

At a meeting of said Executive and Finance Committee, held on the same day, all the members of said Committee being present, by unanimous vote of said Committee, it was

Resolved that the Vice President of the Company sign the Company's name, and also his own name as Vice President, and that the Secretary do set the Corporate seal of the Company, and his own name as Secretary, to an instrument in the form following and designated "Power of Attorney", and that being so executed, the Vice President do deliver such instrument to Joshua D. Bailey as the act and deed of the Company.

#### "Power of Attorney"

Know all men by these presents, that William H. Nelson Telephone Company of New York, Limited, being a Corporation created by and existing under the laws of the State of New

that in the United States of America, or the owner it is may acquire Letters Patent of Belgium, Denmark, the Empire of Germany, Austria, Spain, Italy and Russia for certain existing and future inventions of Thomas A. Edison, George M. Phelps, John A. Gray and Frederick H. Litch, in or relating to speaking telephones, and it is among the objects for which such corporation was created to sell such letters patent or interests thereunder or rights to use the inventions covered thereby, in the several countries above named.

Now, for the purpose of furthering such objects of the said corporation and of the business connected therewith:

That the Edison Telephone Company of New York, Limited, has made, constituted and appointed, and does hereby make, constitute and appoint *John A. Gray, of New York, do I, John A. Gray, do hereby and lawfully attorney for it and in its name, place and stead, (1) To select, procure and procure for the said Company and on its behalf Letters Patent of Belgium, Denmark, the Empire of Germany, Austria, Spain, Italy and Russia, for all inventions, improvements and discoveries in or relating to speaking telephones of Thomas A. Edison, George M. Phelps, John A. Gray and Frederick H. Litch, to which the said Company is now or may hereafter become entitled; and for these purposes to make, sign, seal, stamp, acknowledge, verify and deliver or file, in the name and on the act of the Company, all caveats, specifications, petitions, applications or other writings, with or without seal, stamp necessary to be made in or about procuring such letters patent - or to protect the right or title of the Company to any of them, and to employ*

and pay all patent solicitors or other professional persons whose services may be required for any of the purposes above named, or in connection therewith, and to pay all necessary and proper fees and charges incurred in any of the matters aforesaid; and, in the name and on the act of the Company, to make, sign, seal, stamp, acknowledge, verify, deliver or file, in or other writings, with or without seal, stamp, to do all other acts and things whatsoever which may be necessary or necessary to be done, in or the judgment of counsel attorney expected to be done to secure, protect or perfect the right, title or interest of the Company in and to all and any of the letters patent and inventions aforesaid and the various uses, benefit and enjoyment of the same in each of the countries above named, and to execute all such letters patent or other instruments of title in connection, and to give complete receipt and acquittance of the Company therefor. (2) To represent, as the chief business manager of the Company in Europe, its interests, business and affairs there, and, as such representative, on its behalf, to show, conduct and, subject to the ratification of the Company, to complete negotiations for the sale of such letters patent or any of them, in all or any of the countries above named, or if understood, or other interests therein, or of rights thereunder of any character, or for the granting of licenses or other rights to use or enjoy all or any of the said letters patent or all or any of the inventions covered thereby, either in the whole territory of the respective countries above named or in portions or places therein; or to negotiate for such other disposition of the Company's property, rights and interests in any of the said inventions or letters

patent, or said attorney may think most advantageous for it, and, upon ratification by the company as aforesaid of the terms and conditions of any such negotiated sale or other disposition, to consummate the same, and thereupon to make, sign, seal, stamp, execute, acknowledge, verify and deliver, in the name and as the act and deed of the company, all such grants, contracts, covenants, instruments of sale, assignment or license - or other instruments in writing of every character which may be necessary or proper, in the judgment of said attorney, to accomplish the purpose of such transactions, so concluded and ratified.

b.) In the name and on behalf of the Company to ask, receive and give acquittances for all moneys that may be at any time due to it, and to make all disbursements and incur all expenses necessary to be made or incurred in order to accomplish any of the things herein authorized to be done by it said attorney, provided however that he is not authorized and shall not have the power to bind the Company, either for such disbursements or expenses or for any other purpose, to pay any larger sum than five thousand dollars in all. Hereby giving to said attorney power to substitute an attorney or attorneys in his place for any of the purposes and with the same powers herein named, and with power to over said attorney to make any such appointment of a substitute or substitutes, in his discretion, during the continuance of this power.

In Witness whereof the said "The Edison Telephone Company of Europe, Limited," has hereunto set its corporate seal and

caused its corporate name to be here signed by the hand of its Vice President and attested by its Secretary the seventh day of May in the year one thousand eight hundred and seventy nine.

In presence of

And on the 17<sup>th</sup> day of May an instrument in the form foregoing was so executed, and, as is about the 19<sup>th</sup> day of May, being duly acknowledged by said Vice President and Secretary, was delivered to said Party.

A meeting of the directors of the  
Edison Telephone Co. of Europe <sup>limited</sup> was held  
January 13<sup>th</sup> at the office of the company  
No 19 William St in the city of New York  
Mr. James H. Banker Vice President  
in the chair

~~Present~~

James H. Banker

R. L. Fetting

R. L. Fetting Jr

The Vice President announced the death  
of Dr. J. S. White President of the company  
and a director in the same

On motion duly made & seconded the  
vacancy caused by the death of Dr. White  
was filled by the election of Henry M.  
Lewis of Philadelphia and the secretary  
was directed to notify Mr. Lewis of his  
election.

Mr. James H. Banker was thereupon  
elected President of the company and  
Mr. R. L. Fetting Vice President.

On motion duly made & seconded <sup>it was resolved</sup> Mr.  
James H. Banker <sup>he</sup> ~~was~~ <sup>is</sup> ~~authorized~~ <sup>authorized</sup> to  
cancel alter or amend the power of  
attorney heretofore given to Mr. Joshua  
P. Bailey <sup>on the 15<sup>th</sup> of May 1879</sup> and that secretary ~~was~~ directed to furnish

Mr. Banker with a copy of these <sup>resolutions</sup> ~~resolutions~~  
acted by the board of the company  
On motion duly made & seconded it  
was resolved that full power be given  
to the President Mr. Banker to act  
for the company while in Europe and  
that such power be drawn up by the  
Attorneys of the company  
on motion the board adjourned

R. L. Fetting Jr  
Secretary

A meeting of the directors of the Edison Telephone Co. of Europe, Limited, was held May 15, 1880 at the office of the company, 107 William St. in the city of New York.

Present: N. L. Cutting

J. A. Edison

H. M. Lewis

The other directors, J. A. Edison & H. M. Lewis, being absent from the country.

Mr. N. L. Cutting, Vice President, presided.

On motion of Mr. Edison, H. M. Lewis was appointed Secretary pro tem.

The minutes of a meeting of January 13, 1880 were read & upon motion approved.

On motion of Mr. Lewis it was ordered that the annual meeting of stockholders be called for Friday, Jan. 24, 1880, at 2 o'clock P.M.

On motion of Mr. Lewis it was ordered that after the assignment of the interests in patents & inventions agreed to be transferred to the Company by the agreement of April 29, 1879, between Edison, White, Hoskins, Bailey & Brainer, the stock of the Company be issued by proper certificates, to the parties entitled thereto, according to their respective interests.

On motion of Mr. Lewis the following form of Stock Certificate was approved;

No. ---

--- Shares

The Edison Telephone Company of Europe, Limited  
Incorporated under the laws of the State of New York.

This is to certify that

is entitled to Shares in the  
Capital Stock of the Edison Telephone Company  
of Europe, Limited, Transferable only on the Books  
of the Company in person or by attorney, upon  
surrender of this Certificate.

(Seal)

Secretary

President

C. L. McGowan

H. M. Lewis

Secretary pro tem

New York June 11 1880  
A meeting of the Board of Directors of the Edison Telephone Co of Europe Limited was held at 260 N. 6th today at the office of the Company No 19 William St. Present James W. Barker Pres & Edison Robert L. Cutting & W. A. Lewis the President Mr Barker in the Chair Mr Barker moved that the assignments heretofore tendered to the Company as referred to in Minutes of meeting of June 5<sup>th</sup> 1880 be accepted on account of subscriptions to stock & that the five hundred shares of stock as subscribed be now issued to the subscribers as of record - Carried unanimously Mr Lewis moved that inasmuch as it is desired to issue certificates of stock which by statute are required to be countersigned by the treasurer and inasmuch as the treasurer elect is now absent in Europe the office of Treasurer is hereby declared vacant & Robert L. Cutting is appointed treasurer pro tem, during the pleasure of the Board - Carried unanimously Mr Barker presented contracts for account of the Company with parties in

Notes of meeting of June 11 1880  
The Board of Directors of the Edison Telephone Co of Europe Limited met at 260 N. 6th today at the office of the Company No 19 William St. Present James W. Barker Pres & Edison Robert L. Cutting & W. A. Lewis the President Mr Barker in the Chair Mr Barker moved that the assignments heretofore tendered to the Company as referred to in Minutes of meeting of June 5<sup>th</sup> 1880 be accepted on account of subscriptions to stock & that the five hundred shares of stock as subscribed be now issued to the subscribers as of record - Carried unanimously Mr Lewis moved that inasmuch as it is desired to issue certificates of stock which by statute are required to be countersigned by the treasurer and inasmuch as the treasurer elect is now absent in Europe the office of Treasurer is hereby declared vacant & Robert L. Cutting is appointed treasurer pro tem, during the pleasure of the Board - Carried unanimously Mr Barker presented contracts for account of the Company with parties in

Belgium & Russia.

On motion the meeting adjourned.

New York June 16 80  
At a meeting of the Board of Directors of the Edison Telephone Co Limited their being present J. T. Bailey A. Barker & A. H. Hewson Mr. J. T. Bailey Mr. Wm. A. Edison being nominated was balloted for and elected President receiving 4 votes Mr. Barker being nominated was balloted for and elected Vice Pres receiving 3 votes Mr. J. T. Bailey being nominated was unanimously chosen as Secy to hold office during the pleasure of the Board. R. L. Cutting being nominated was unanimously chosen Treasurer to hold office during the pleasure of the Board.

Mr. Bailey & Mr. Hewson were nominated a committee to examine and report back to Board any proposition for the sale of telephone patents of the different countries of Europe. After some unimportant business the meeting adjourned until Monday June 21 1880

J. T. Bailey  
Secy



New York June 21, 1880

A Meeting of the Directors of the Edison Telephone Co. <sup>of Europe</sup> Limited was held at 12 noon this day there being present Messrs Bailey, Charles H. Wigwink & Griffin. The minutes of the previous meeting were read by the Chairman. The subject of the European Contract was then taken up. The Russian Contract having been read it was moved by Mr. Bailey and seconded by Mr. Parker that the Russian Contract be accepted and that the President Mr. Edison be requested to send a cable to Mr. Hargreaves (Paris) requesting him to receive the 5000 francs account of the Russian Contract. After some discussion regarding the Belgian Contract it was agreed that the matter would be brought up and the contract ratified at the next meeting. Adjourned until Thursday June 24, 1880

W. L. Griffin  
Secretary

New York June 24, 1880

A Meeting of the Directors of the Edison Telephone Co. of Europe Limited was held at the Comptroller's Office 4 Wall Street N.Y. at 2 P.M. There being present Messrs Edison, Ba. W., Hargreaves, Bailey & Griffin. The minutes of the previous meeting having been read the Belgian contract was taken up. After having been read it was moved & seconded that the contract be accepted. A general discussion regarding European Telephone matters occupied the meeting until 4 P.M. where it was moved & seconded ~~that no expenditure be incurred by this company without the written order of the President.~~ The meeting then adjourned until June 30<sup>th</sup> 2 P.M.

W. L. Griffin  
Secretary

11/1 June 5, 1880

Special Meeting.

Present: Messrs. Parker, Thompson, Griffin.  
Mr. Parker opened the following resolution which was  
then seconded:

Whereas, the business of the Company does  
not justify the continuance of the former  
terms of attorney given to S. T. Main (the same is  
being renewed) and the President is hereby  
requested to notify Mr. Main to this effect.

Mr. Griffin having reported on order for Boston  
your Order it was seconded & resolved that same  
be made contracts to give to Mr. Edison the  
President.

No further business being brought forward the  
Meeting adjourned.

S. T. Griffin  
Secy

New York Aug 20<sup>th</sup> 1880

At a special meeting of the Directors  
of the Edison Fil Co of Europe Ltd  
this day the following Gentlemen  
were present: Messrs. Baile, Dillingham,  
and Griffith.

The matter of negotiations with  
General & the Bell Co in Boston was  
discussed - Mr. Parker suggested that  
Messrs. Baile & Perkins go to Boston and make  
the proposition to the Bell Co to join interests  
with the Edison Fil Co at the rate of 55-45

Mr. Parker's suggestion was concurred  
in and the Gentlemen mentioned as a Committee  
arranged to go to Boston next Monday Aug 23<sup>rd</sup>

Adjourned until Wednesday Aug 25<sup>th</sup> 1880

S. T. Griffin  
Secy

New York, Aug. 30, 1880

At a special meeting of the directors of the Edison Telephone Co. of Europe Limited held this day the following gentlemen were present: Mr. H. A. Barker, Bailey, Hye-wisch and Griffin.

The Committee consisting of Messrs. Poshon & Bailey reported as follows: He called on Mr. Russell in Berlin yesterday and suggested an amalgamation on a basis of \$500,000. Mr. Russell said he would not negotiate until he knew the conditions and said time around in the afternoon. Called as requested met Mr. Carl and Mr. Russell. Mr. R. said he would call a meeting of the Board of Directors Friday next and the result would be reported to this Co. as he would visit Mr. himself in regard to it. Mr. R. called on Mr. Converse of the International Tel. Co. and was informed that the President, Secy & Treas. of the Co. were in Europe that two of them had just started for the U.S. and nothing could be done until they returned.

Mr. Barker requested the Secy to send the following telegram.

Merle Park N.Y. Aug 24, 80  
James H. Barker N.Y.  
Forward off 20 in addition to two

dollars yearly royalty a guarantee that first year shall not be 10,000 in royalty. Think for better close the thing up this basis.

Edison

On motion of Mr. Barker the telegram was referred to Messrs. Bailey & Poshon as a Committee to wait on Mr. Edison and learn his views further.

Mr. Bailey moved & it was duly seconded that all business on deposit with Drexel Morgan & Co. of Paris whether to the account of James H. Barker or to the Edison Tel. Co. of Europe be transferred to Drexel Morgan & Co. of New York who are hereby authorized to act as bankers for this company. All checks will bear the company seal and the signature of the President and Treasurer and the Secy is hereby authorized to notify Messrs. Drexel Morgan & Co. of this action of the directors.

Adjourned to 10 AM Monday Aug 30, 80

J. L. Griffin  
Secy

Monday Aug 30<sup>th</sup> 1880  
Special Meeting Present Messrs Barker  
Bailey & Griffie present.

After general discussion regarding Committee  
affairs referred to in the minutes of last meeting  
the Committee on negotiations reported progress.

After interview with Mr Edison a proposition  
for an English scheme should be prepared  
by the Committee in consultation with Mr Edison  
President, in view of having Messrs Barker and  
Bailey go to London.

Adjourned to Friday Sept 3<sup>rd</sup> 1880-11<sup>th</sup>  
S. L. Griffie Secy

Friday Sept 3<sup>rd</sup> 1880  
Special Meeting  
Present Messrs Barker Bailey Thymers & Griffie

The Secy read the following letter

S. L. Griffie  
Sey Co Ltd & Co Large Limited  
London Aug 30<sup>th</sup> 1880  
New York

Dear Sir: After consultation with my Directors I  
am forced to say that although I should be glad  
to cooperate in the effort to harmonize our interests  
in those countries where we are interested, the  
terms proposed by Messrs Bailey and Barker whom I  
had the pleasure of meeting here on the 24<sup>th</sup> inst  
are such that I cannot accept them.

Very respy yours  
(Signed) H. S. Russell  
Pres. Continental Telephone Co

The Committee on negotiations reported that having  
met the President Mr Edison at Muncie Park in  
pursuance to the resolution passed at the last special  
he agreed to having the Committee consisting of Messrs  
Bailey and Griffie go to London for the purpose of nego-  
tiating with parties there for the sale or licensing of the  
remaining Edison Telephone Co interests in Europe

Mr. Barker moved and the motion was seconded that the Board pass a resolution empowering Messrs. Ruschka & Bailey to negotiate the remaining Edison Telephone Company's interests to English capitalists.

Mr. Hegenwald then offered the following resolution: Resolved That a committee consisting of Messrs. Ruschka and Bailey be and are hereby authorized to proceed to Europe for the purpose of negotiating and concluding terms of sale or licensing under the patents that are owned by this Company for any or all of the following countries to wit: Spain Italy Austria Germany

such negotiations for licensing or sale of said patents to be subject to ratification by the Board of Directors of this Company on communications made by letter or by cable addressed to the Secretary of the Company and may be closed by Messrs. Ruschka & Bailey on authorization by letter or cable signed by the President of this Company.

Resolution carried unanimously. Mr. Hegenwald then offered the following resolution which was carried.

Resolved That the President be authorized to issue the remaining certificates of stock of this Company to the various parties entitled to it in accordance with existing contracts namely

N.Y. Jan'y 14, 1881

Special Meeting

Present Messrs. Edison, Barker & Croffier.

The matter of the settlement of Russian Telephone Co. was taken up and the Secretary authorized to call on W. Russell, the Co's attorney, and have the necessary papers drawn up immediately and returned to Mr. James H. Barker to be by him forwarded to the proper party in Europe and to be delivered on the payment of \$50,000 francs. adj<sup>d</sup>

N.Y. 2<sup>d</sup> June 1881  
Col. Geo. E. Bonnard  
and Theo. Neubas Esqrs.  
b. Lombard Street  
London. Eng

Dear Sir

- Herewith enclosed please find
- (1<sup>st</sup>) Schedule of Assignments of Various Telephone Patents to the Edison Telephone Company of Europe Limited
  - (2<sup>d</sup>) Certified Copies of all the said Assignments (24 in number)
  - (3<sup>d</sup>) Certified copies of the Contracts executed by the Edison Telephone of Europe Limited and Charles de Nothbeck, of St. Petersburg, Nihil-Bougen and others of Brussels and Tchernia de Rybinsky and others of Roudapher (3 enclosed) by the above foregoing this will be transmitted to J. B. Hingand & Co. of 22 Broad Street London the originals of the above named papers and also a general assignment by the Edison Telephone Company of Europe Limited of all the aforesaid Assignments and Contracts to the European Telephone Company with instructions to deliver the same when the said Company shall be duly constituted against the payment of the consideration stipulated on the Contract with the said Company
- Yours truly, Thomas A. Edison  
President Edison Telephone Company of Europe Limited

N.Y. Mch 28<sup>th</sup> 1881  
Charles de Nothbeck Esq.  
Ingenieur  
St. Petersburg

Dear Sir

I beg to advise you that in conformity with the Contract between yourself and the Edison Telephone Company of Europe Limited and dated 11<sup>th</sup> 1880 the transfer of the Application for Patents for the Telephone ~~Company~~ of Europe in Russia owned by the Edison Telephone Company of Europe Limited has been duly executed and deposited with Messrs Drouot Hauger & Co of Paris and papers covering the assignment of all the rights of Thomas A. Edison and the Edison Telephone Company of Europe Limited to all Patents applied for or to be applied for in Russia. I have to request that you will accordingly pay in to the credit of the Edison Telephone Company of Europe Limited, at Messrs Drouot Hauger & Co. the sum of fifty thousand francs in accordance with the agreement entered into with the Company and receive from Messrs Drouot Hauger & Co. the papers above described

Yours truly,  
Thomas A. Edison  
President Edison Telephone Co of Europe Limited

28 Mar 1881  
Mef. Drosow Jensen  
33 Chancery Lane  
London W.C.

Dear Sirs

Please find enclosed herewith order of  
Remuel W. Bernal for the delivery of the Certificate  
of deposit of the Russian Patent of Thos. A. Edison  
for improvements in instruments for controlling the  
transmission and reproduction of sounds effected  
at the end of 1877 or beginning of 1878 and  
also the said patent of granted to the order of  
and as may be requested directed by the  
President of the Edison Telephone Co. of Europe Limited  
Please deliver the above papers to the properly  
transferred to Chas. de Hottelbeck Ingenieur St.  
Petersburg and have the transfer properly certified  
by the Russian Consul at London and transmit  
same to Mef. Drosow Jensen & Co. 31 Boulevard  
Hausmann Paris for delivery to the de Hottelbeck  
order subject to the terms of my letter to  
Mef. Drosow Jensen & Co. of this date

Yours truly  
Thomas A. Edison  
President  
Edison Telephone Co. of  
Europe Limited

At the Annual Meeting of the Stockholders  
of the Edison Telephone Company of Europe Limited  
held at the office of the Company 38 19 William Street  
New York City on the 10<sup>th</sup> day of May 1881

The meeting proceeded to the election of five directors  
for to manage the affairs of the company for the ensuing  
year.

Mrs. C. L. Howard and W. L. Cutting were appointed  
Inspectors of Election, and upon a canvass by such  
Inspectors it was found that votes representing 114 shares  
had been cast - all for each of the following named  
persons, who were thereupon declared duly elected  
Directors for the ensuing year: viz.

Thomas A. Edison  
James H. Barker  
of Hagerstown  
R. L. Cutting  
R. L. Cutting, Jr.

There being no further business meeting adjourned

New York June 4, 1880

At the annual meeting of the stockholders of the Edison Telephone Company of Europe Limited called by notice sent according to law on motion of H. M. Lewis Mr. R. L. Cutting was nominated as chairman and Mr. J. F. Bailey as Secy. Present Mr. R. L. Cutting Mr. H. M. Lewis representing by proxy the Estate of Dr. S. S. White Mr. J. L. representing by proxy Mr. T. A. Edison and J. F. Bailey.

On motion of Mr. Lewis the meeting of stockholders was adjourned to June 5, 1880 at half past 12 p.m. which was voted unanimously and the meeting adjourned accordingly.

J. F. Bailey  
Secy.

New York June 5, 1880

The adjourned meeting of stockholders was called to order by the Chairman Mr. R. L. Cutting at half past 2 p.m. Present Mr. James H. Barker Mr. H. M. Lewis representing the Estate of Dr. S. S. White Mr. S. L. Griffin representing Mr. T. A. Edison J. F. Bailey and Mr. J. L. representing the Council of the Company.

Several assignments of patents and other interests in inventions relating to speaking telephones were presented to the Company by Thomas A. Edison, J. Clarence White and Saml. S. White Jr. Executors of Dr. S. S. White deceased and Joshua F. Bailey and others being the several instruments described as follows to wit:

1. First assignment dated May 1st 1880 by Thomas A. Edison of all said inventions and patents thereto in Germany Austria Hungary Russia Denmark Italy and Spain
2. Assignment dated May 1st 1880 by Joshua F. Bailey & Thomas A. Edison of German patents No. 44946 & No. 500110
3. Assignment dated May 1st 1880 by Joshua F. Bailey & Thomas A. Edison of Belgian patents No. 44946 & No. 500110
4. Assignment dated May 28, 1880 by Thomas A. Edison to James H. Barker & Amster.



of application for patent in Empire of Russia

- 5 Assignment dated May 28 1880 by Thomas A Edison of Belgium patents No 43754 and No 43375
- 6 Assignment dated May 28 1880 by Thomas A Edison of Spanish patent granted May 6, 1878.
- 7 Assignment dated May 28, 1880 by Thomas A Edison of application for patent in Empire of Germany
- 8 Assignment dated May 28 1880 by Thomas A Edison of Austrian patents dated Jan'y 1 1879 and Jan'y 8 1879.
- 9 Assignment dated May 28 1880 by Thomas A Edison of Italian patents of Feb'y 8 1878 and July 11, 1878
- 10 Assignment dated May 31 1880 by J Clarence White and Samuel S White Jun'rs Executors of all right and interest in inventions and patents of Phelps Gray and Titch in Germany Austria-Hungary Denmark Russia Spain Belgium and Italy
- 11 Assignment dated June 3<sup>d</sup> 1880 by Joshua F Bailey J Clarence White and Samuel S White Jr as executors &c and George M Phelps of Belgian patent No 49994

12 Assignment dated June 3<sup>d</sup> 1880 by Joshua F Bailey J Clarence White and Samuel S White Jr as executors &c and George M Phelps of German patent No

13 Assignment dated May 11 1879 by Joshua F Bailey of all right & interest in patents and inventions in Germany Belgium Denmark Russia Spain Austria & Italy - having been

tendered to the Company in execution of agreements made by said parties for the benefit of the Company

Resolved that it is hereby recommended to the Board of Directors that said assignments be accepted by the Company

of application for patent in Empire of Russia

- 5 Assignment dated May 28 1880 by Thomas A Edison of Belgian patents No 43984 and No 43378
- 6 Assignment dated May 28 1880 by Thomas A Edison of Spanish patent granted May 6 1878.
- 7 Assignment dated May 28 1880 by Thomas A Edison of application for patent in Empire of Germany
- 8 Assignment dated May 28 1880 by Thomas A Edison of Austrian patents dated Jan'y 1 1879 and Jan'y 8 1879.
- 9 Assignment dated May 28 1880 by Thomas A Edison of Italian patents of Feb'y 8 1878 and July 11 1878
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13 Assignment dated May 11 1879 by Joshua F Bailey of all right & interest in patents and inventions in Germany Belgium Denmark Russia Spain Austria & Italy - having been

transmitted to the Company in execution of agreements made by said parties for the benefit of the Company

Resolved that it is hereby recommended to the Board of Directors that said assignments be accepted by the Company

New York June 8, 1880.

The adjourned meeting of the stock holders, was called to order at 2 P.M. by Mr. R. L. Cutting, Chairman. The minutes of the last meeting were read and accepted. A discussion then took place as to the issue of stock to the subscribers, in which Messrs. Banker, Cutting, Lewis and Bailey took part. Mr. Lewis offered a resolution that it is the sense of this meeting that "the assignment of patents already made" "on account of a value sufficient to warrant the" "issue of the 500 shares already subscribed." Mr. Banker remarked, after the resolution had been seconded by Mr. Griffin, that he objected to fixing any value on the patents. Mr. Bailey proposed to Mr. Lewis to amend his resolution so as to make it read "the assignments made warrant the issue of the 500 shares" &c.

This amendment being accepted by Mr. Lewis the resolution as follows, was put to vote: "Resolved, that it is the sense of this meeting, that the assignments of patents and other interests already made to the Company and as set forth in the resolution passed June 5, warrant the issue of the 500 shares already subscribed, and that such 500 shares be issued to the persons and for the

amount, following, to wit:-

Thomas C. Edison	250 shares
Samuel S. White	83 "
J. D. Bailey	83 "
James H. Banker	25 "
Robert L. Cutting	25 "
Robert L. Cutting Jr.	25 "

The resolution as above was passed by the following vote.  
Messrs. Lewis, Griffin & Bailey, in the affirmative.  
Mr. Banker, negative.

The meeting then adjourned to meet at 3 P.M. June 11, 1880.

J. D. Bailey  
Secy

New York June 11, 1880  
We Walter L. Cutting, George Howard and Charles H. Howard on this day duly appointed inspectors of election to act at the annual election of Directors of the Edison Telephone Company of New York Limited being <sup>consequently</sup> sworn each for himself depose and say that he will discharge the duties of his said office with fidelity and that he

not receive any vote but such as he intends  
to be legal nor reject any which he intends  
to be legal

(Signed) W. L. Cutting  
Geo Howard  
Charles H Howard

Lawyer subscribed

before me this 11<sup>th</sup> day  
of June 1880

Signed W. D. Dearlove

Notary Public

N.Y.C.

The inspectors above named hereby report  
to the meeting that the following named  
persons have received the highest number  
of the votes cast for directors and are elected  
viz Thomas A Edison, James H Banks, S. L.  
Griffin, A Hewitson and J. T. Bailey.

(Signed) W. L. Cutting

1 A Edison 418 votes

J H Banks 411 "

S L Griffin 411 "

A Hewitson 411 "

J T Bailey 550 "

(Signed) Geo Howard  
Charles H Howard

THOMAS A. EDISON PAPERS MICROFILM EDITION, PART I (1850-1878)  
SUPPLEMENT

The materials in this supplement cover the years 1875-1878. Most of the documents date from 1878. Included are letters, agreements, technical notes and drawings, legal statements, circulars, and other documents relating to the phonograph, multiplex telegraphy, the electric pen and autographic press, and the aerophone. Significant authors and recipients include Edison, George H. Bliss, Edward H. Johnson, George B. Prescott, Theodore Puskas, and the Edison Electric Pen & Duplicating Press Company.

Most of these documents are part of a cache of property stolen from the Edison National Historic Site in 1976. The stolen materials were recovered in 1985, after the completion of the Thomas A. Edison Papers Microfilm Edition, Part I. There are approximately one hundred documents, and they appear on the microfilm in chronological order.

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**SUPPLEMENT TO PART I**

**1875**

Oct 2<sup>nd</sup> 1875

It is understood that T A  
Edison Receives 6.13. Laboratory  
115. Batchelor 246. & gas  
Adams 27¢. on each A10.  
made in Autographic Press.

T A Edison  
Chas. Batchelor  
for Adams



## ELECTRO-AUTOGRAPHIC PRESS

The only process yet invented whereby an unlimited number of impressions can be taken with rapidity from ordinary manuscript. One hundred copies of an ordinary letter can be beautifully printed in

FIVE MINUTES.

after it has been written. Beautiful

COPIES OF A DRAWING

map, etc. can be taken. For the economical printing of

ADVERTISING CIRCULARS  
It is unequalled.

This circular is printed by the autograph process.

**SUPPLEMENT TO PART I**

**1876**

No.

Newark, N. J. Febr 16<sup>th</sup> 1876



MECHANICS NATIONAL BANK

Pay to the order of Const & Hanson & Co.

— Fifty —

Dollars.

\$50.00

Res. A. C. Lion

Anders Hansen

No

Newark, N. J. February 16<sup>th</sup> 1876



MECHANICS NATIONAL BANK

Pay to the order of *M. A. Collins*

*Fifty*

Dollars.

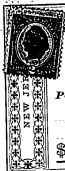
\$50.00

*Thos A. Edison*

*M. A. Collins*  
Pay Mrs. Sarah Pratt  
or order \$100.00

*Sarah Pratt*

FOR DEPOSIT IN  
NAT'L STATE BANK,  
Newark, N. J.  
CREDIT OF  
REPUBLIC TRUST CO.



**MECHANICS NATIONAL BANK**

Newark, N. J., June 17

1876

Pay to

Two thousand three hundred

Dollars.

\$2,300

Thos A Edison.

order  
or Bearer,

FOR DEPOS

Merchants Na

Credit Co

Pay MERCHANTS NAT'L B'K., NEWARK,  
or Order for Collection.  
W. H. COX, Cashier.





\$76 <sup>32</sup>/<sub>100</sub>

Newark, N.J.

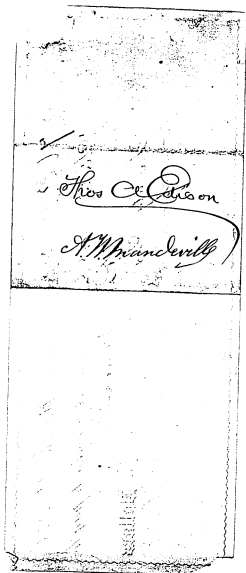
March 11 1876

Sixty <sup>32</sup>/<sub>100</sub> after date we promise to pay to  
the order of J. M. Mandeville

Seventy <sup>32</sup>/<sub>100</sub> Dollars  
for value received at Mechanics National Bk

No. One 13 May

G. L. Leland & Co



Thos C. Carson

A. M. Mandeville

**STANDARD**



4 miles from Railroad

Newark, N.J. Sept 5<sup>th</sup> 1876  
Four Months ago I promise to pay, to  
the order of Samuel Adams  
One hundred and fifty Dollars  
at the National Mechanics Bank  
New York  
This I received  
Due Samuel Adams A. Carson  
months back

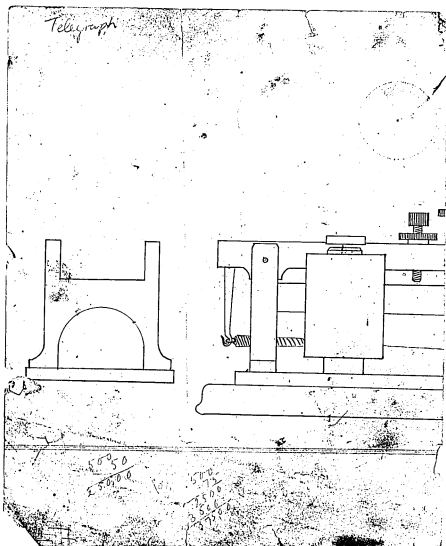
Regd. by Am. Patent Office, N.Y.

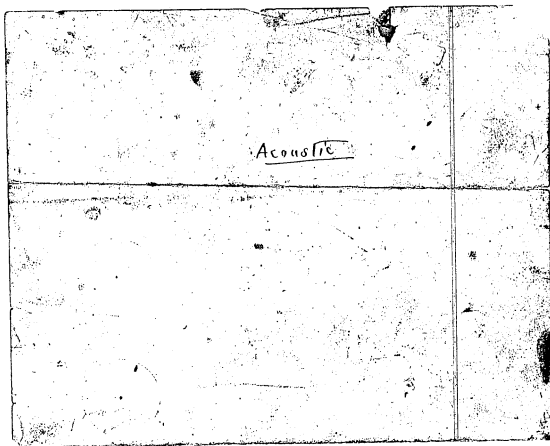
1277

James Adams

~~James Adams~~

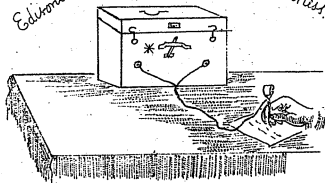
Telegraph





Edison's Electric Pen & Duplicating Press.

11-13



Sample of work done by the above beautiful  
adaptation of Electricity to Writing & Printing.

Has: Edwin Wilson  
District Manager  
59 Piccadilly  
Manchester.

\* This line is the 'on' & 'off' arrangement -  
this is one of the first attempts at changing the apparatus so  
that it considerably improves on it. 2005

**SUPPLEMENT TO PART I**

**1877**



THE

# AMERICAN NOVELTY COMPANY

CIRCULAR.

52 BROADWAY, NEW YORK, JANUARY 10, 1877.

## EDISON'S DUPLICATING INK.

This Duplicating or Transfer Ink, designed for the multiplication of copies by means of the common Letter Press, has properties entirely distinct from any other in the market. It will do the following:

First. One original writing will yield in the ordinary Letter Press, without other appliances than those used in ordinary copying, 20 to 30 copies upon Tissue Paper.

Second. It will yield from 10 to 20 copies upon LETTER PAPER—an entirely new feature; these copies being re-transferred from a Tissue Copy, are right side up and readable from the face of the paper and not *through* it.

Third. It will also yield copies either from the original or from the copy at any time subsequent to the original writing, thus making it practicable for Lawyers, Merchants, Brokers, Reporters, Insurance and Real Estate Agents, Clergymen, and the Professional Business Community generally, at any time to duplicate any paper which they may have on record. Also enabling the recipient of a letter written with this ink, to obtain from such letter a number of copies (facsimiles) without the labor of re-writing; also giving the writer of a letter a copy, in addition to his letter-book record for filing in his pigeon hole with matter of the same subject, thus keeping a complete record of the whole matter at hand for convenience of reference; this saves the annoyance of hunting through a promiscuous letter-book for correspondence upon any given matter. The property of transferring upon hard paper (letter paper,) being an entirely new one, and possible with no other ink, creates for this a new field, and one, which, in view of the simplicity of the means by which these novel results are obtained, must immediately be occupied by it.

### PRICE.

No. 1 Bottles,	.50
No. 2     (Half-pints),	\$1.50

FOR SALE BY

1875. 1875  
Acoustic

Autograph  
Telegraph  
1875

6 chene

1875

**The American Novelty Company,**

THOS. A. EDISON,

*President,*

E. H. JOHNSON,

*Refg. Press and Card Manager,*

J. E. SUTTERLIN,

*Manager Stationery Department,*

EDISON'S DUPLICATING INK,

JOHNSON'S RIBBON MUCILAGE,

AND

NUMEROUS OTHER USEFUL ARTICLES OF SMALL COST.

**No. 52 Broadway,**

*Jan 16<sup>th</sup> 1894*

NEW YORK.

William Orton,  
President.

Executive Office.

Western Union Telegraph Company.

New York, Feb'y 10, 1877.

Thomas A. Edison Esq.,  
Menlo Park, N. J.

Dear sir:

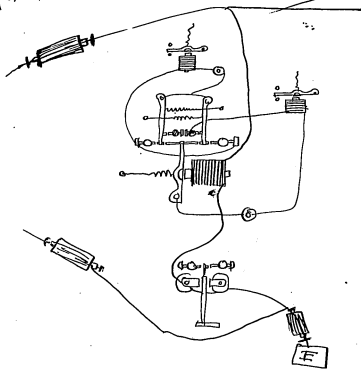
Herewith enclosed I  
send you a bill of L. W. Serrell Esq., with  
request that you will note an item of  
\$249. for time and attention at Wash-  
ington and New York given to your  
improvements in Acoustic Telegraphy  
&c. &c. and requesting from you a state-  
ment concerning the services rendered  
by Mr Serrell in that behalf and an  
opinion as to the reasonableness of the  
charge.

LWS  
your attend of bill  
"re: telegraph" in the  
journally "is" a bill  
of the "done for" of  
acoustic. "re: the" of  
Comm.

Very respectfully,  
Wm. Orton  
President

New Cotton St. U. S. L. C.  
Feb 10. 1844

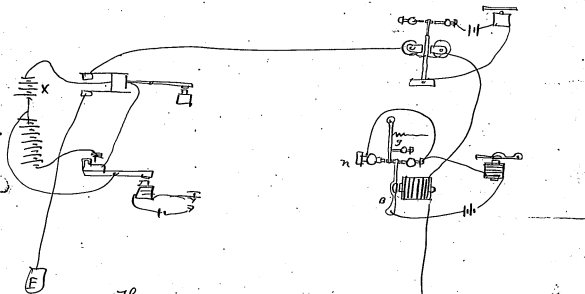
Siedler ER - May 6 1877 T.A. Edison



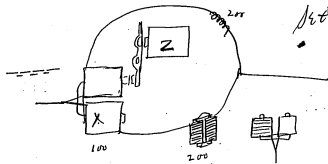
An improvement on the Reed

May 6 1877  
J. Adams

James Adams



The permanent current from X  
 keeps B from contact  
 with N. by reason of a constant magnetic  
 but at the moment of reversal all  
 magnetism disappears and B touches N thus  
 g. the going from point to point keeps  
 sound closed.

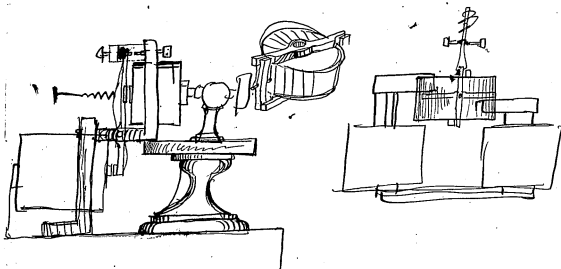


150

Make the inductive charge equal (in its effect on X) to the effect of the current effect in Z.



W. M. K. & Co.  
June 6 1897  
J. A. K. & Co.



June 20, 1877

Henry,

Please give bearer Mr Adams  
\$25. of the money in your hands  
J A Edison

Joe Adams

June 20. 77

\$20.

De Groot

of the mound in clay pits.

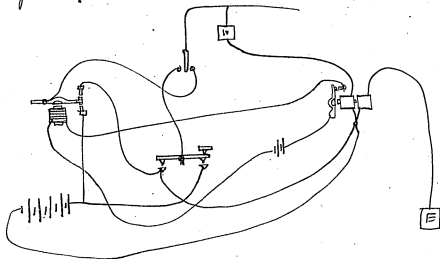
General Store across W. of bridge

Heard.

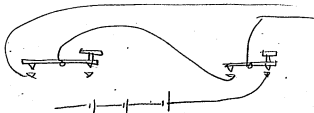
Duplex Devices from  
foreign works - Pub =

June 21 1877

*JOHNSON*



*Plants*



Can't 13 that

Friend David.

Winnipeg, N.B.

July 9 1897

Did I understand you to say when I saw you  
last that when the newspaper article was read to you  
that you had no idea of the nature of the article  
beforehand and did not follow the speaker with a  
duplicate newspaper - why I ask this is that  
I remembered one of your remarks to the effect  
that it came so perfect that you even corrected  
an error and that made me think that you was

following the speaker with a duplicate.  
I have mine to such a point that although it  
is difficult to understand a long sentence from  
a newspaper the subject being unknown to you  
that ordinary conversation is quite easy so  
much so that I do not have any doubt but  
that it will answer for private letters - it is  
very loud & no extraneous noise is felt in it  
between here & my place as well although  
symptoms could be felt in this way

I have just finished a pair of Bell's instruments  
<sup>with difficulty from that one</sup>  
and I cannot do more as well as with my own but  
perhaps I have made them wrong - Write me results you have  
attained so far -

Yours T. A. Edison

Friend Edwin -

I write on this side in order to answer your question  
in order - You misunderstood me; the party reading,  
corrected himself - I spoke of it of - showing how readily  
all articulation were communicated - I was not  
following copy -

I am experimenting every day with bells. The greatest  
difficulty is the interference from other lines, and  
from earth currents - If we attempt to use it on  
poles where there are a great many wires, we  
have an sound like fizzing fast, which drowns the  
articulations - I yesterday tried the experiment on a  
single, independent wire, ten miles long. The articulations  
were perfect, but we had some trouble from the fizzing,  
to make you, the line was on separate poles and  
away from other lines - We tried the same experiment  
on the same line the day before with better results, the  
being less fizzing -  
I propose to try now a suitable  
circuit in amongst our other wires and see,  
to what extent we can overcome the noise fizzing.  
Bell's will answer admirably, out of this, at least,  
on a line of a single wire - The articulations  
are so true that you readily make out what is  
being to go - I want to go on and test you  
as soon as you are ready -  
Yours very truly  
J. M. Smith

P. A. Edson Esq.  
Merle Park, N. J.

Dear Sir:

Can't Butler help you in  
securing the Quadriplex patents in  
Europe?

Should be glad to have him do  
so if you wish.

He will visit every Nation.  
Will put you in correspondence  
with him if you wish and send  
him instructions.

Respectfully

Geo. H. Bliss

Genl. Man.

Madison & Wife Co.  
Aug 8. 1877



Wenlo Park N.Y. Aug 16/77

Geo B Prescott

Will you please give me the name of the Book,  
Edition and page, wherefrom the article relating to Reuss  
Telephone was taken,

Yours

J A Edison

Journal of German American  
Telegraph Union Volume nine  
page one hundred twenty five

Yours  
G. B. Prescott

G B Prescott  
Aug 16, 1897

Edison's Electrical Pen & Duplicating Press Co.



P. O. Box 5207.

41 DEY STREET,

NEW YORK.

MANUFACTORY:

MENLO PARK, N. J.

New York, Sept. 4, 1877

Friend Edison -

You don't seem to  
get up here much lately.

Mr. C. says that L. has set  
so many times in his own  
mind to go down to see you  
and failed to be able when  
the time came that he  
will not try to say "when"  
again but stick if any  
time he is able -

Meanwhile he thinks  
for your good some one  
should make you a visit.

He understands why you  
do not want certain  
persons to do so, and I know

Edison's Electrical Pen & Duplicating Press Co.



P. O. Box 2807.

41 DEY STREET,

NEW YORK.

MANUFACTORY:

MENLO PARK, N. J.

New York, \_\_\_\_\_ 187

fully appreciate your beams.  
But, he suggests that  
as you are on Swift's House  
wire that you give him  
(Vain) a written invitation  
to come down.

He will take it to Mr  
O. of course, and will  
get his instructions, which  
will be to "go and see  
and say nothing to any  
one but the man he goes  
for." You will like  
Vain's quiet observing way  
and you can trust him  
surely. He knows but  
one man in New York.

<sup>W. L. Miller</sup>  
<sup>Sch. 4. 1874</sup>  
Patch has got a good  
office here and every  
thing in it that the  
heart of man can  
desire & without doubt  
fine.

Yours  
W. L. Miller

J. V. was away all last  
week, just home now  
and up to him early  
as O. says Gray is  
crowding things, and is  
now here.

M

Mentor Park N.Y. Nov 15 77

Wm. Oulton.

Dear Sir,

Allow me to introduce Mr. Jas Mackenzie, who is manager of the District Tel. Co in Detroit and has been very successful with Bell Telephone. He has been to my place and I exhibited to him several varieties of Telephones, one of which I had abandoned owing to fact I could not hear it well. To my surprise he asserts that it is louder and superior in articulation to Bell's. It is based on a principle which is entirely different from anything now out and is perfectly Constant.

Yours  
T. A. Edison

John Kinsace  
Nov 26. 77

Clinton Wis Nov 26<sup>th</sup> 1877

Mr. Edison

Dear Sir

In a letter to the Scientific American Mr. Edward H. Johnson says that you have conceived the bold and original idea of recording the human voice from which at any subsequent time it might be automatically re-delivered with all the vocal characteristics of the original speaker reproduced. It is indeed a bold and strange advance in the science of sound. Now sir I want to ask if a less bold and difficult idea cannot be practically carried out by the use of the telephone or some other phone whereby a person that is partially deaf for instance part

able to hear a public speaker by being within 2 or 3 feet of it is entirely unable to catch a single sentence when 20 or 30 feet away. This is my case, and that of thousands of others in the land, and such an invention that can be made practically useful would meet with a large demand, and it seems to me to be so simple, (compared with "idea" first mentioned) that it might take but a short time to perfect and put into operation and thus be of immediate use and profit to the inventor and untold benefit to those who need such help. Perhaps you are too much engaged to take what may seem to you a small matter in hand but could you not employ some one expert in telephone experiments to work it out. I am satisfied

that if a speech can be made to sound the same 30 or 50 feet from the speaker that it does close to him it would be great thing for the community. You may recommend ear trumpets and such things to me but they do not fill the bill inasmuch as they convey other sounds as well as the voice of the speaker and makes such a rumbling as to prevent imperfect hearing to distinguish the sounds and withal the speakers voice does not come as he delivers it, but sounds like a voice in a large empty room. Hoping to learn from you soon that you have perfected an apparatus for the purpose stated.

I am Yours Truly  
John Kimball



VENTILATOR GLASS,  
GLASS SLIMS,  
CAN & STEAMWAY LIGHTS,  
PAPER, CASE LIGHTS, &c.  
Glass ground by the Box.

OFFICE OF  
**NEW YORK SAND BLAST WORKS,**

145 & 147 MULBERRY STREET,

SARGENT & BURGER, Proprietors.

ORNAMENTAL  
GLASS GLASS,  
KIDDER'S GLASS,  
ARGAND'S GLASS,  
SHADE GLASS,  
CHIMNEY'S, &c.

New York, Dec 16 1877

Mr J. A. Edison

Dear Sir,

Excuse a letter from me which you  
can read at your leisure. I was very much interested in  
your work & hope you will perfect the wonderful things you are  
doing. I wish I could find the article in the "Times", in which they  
made a very funny article about "talking off the tongue  
of Palmyra & Beecher". So that a little of "talking off the tongue  
of Beecher" could be drawn out when wanted. - You probably  
to believe you will succeed with music but I must doubt if you  
of the human voice. Did you tell me how the reproduction was  
produced is it by "induction as a trumpet" or by electricity. I have not  
it all ready to many who listen with wonder & never heard of  
such a thing but they won't believe until I can explain to them  
as you did to me. The recording of the vibrations & reproducing them  
as then it is a mystery till looked upon as a joke. I should  
think the faint shade of sound would be lost utterly.

In regard to my work I have any feel that  
the true direction for us to look was in printing with some  
indellible ink & then making out with a solvent. if the

them gutta serena I thought some could be made  
so as to be subject, then printed upon their backs and  
with a solvent it might be fast what is wanted. if

I will send you anything on that line then  
I can try with skill as to be admitted to explain  
Mr. Highman's printing process which has some  
difficulties not yet over come

Yours truly

Henry H. Law.

Henry H. Law  
Dec 6-97

[TO JAMES U. MACKENZIE?]

Menlo Park N.J. Dec 12/17

'Dear Mac' =

The Phonograph is a perfect success,  
and soon as I have cheapened the Mechanism  
down a little, I want you to take charge  
of the whole business for this ~~USA~~ & all  
other Countries; But you must think it over  
well, and be ready as we must move quick.  
The new telephone is also a big success,  
& Write me - See Scientific American of  
Dec 22 you will get it next Saturday  
or Monday -

1.

Edison

12.100



Mentto Park N.P. Dec 22 77

R. T. Haines Esq

Dear Sir

I shall have a new one finished next Thursday I think which I will probably have on exhibition at the Electric Pen office 20 New Church St, if not there. the person in charge can probably inform you where it may be seen

Yours  
Thos. A. Edison

What will you take for a half interest in your phonograph patent?

R. T. Haines

378 Broadway-

24 Haines  
dec 22 97

12



**ELECTRIC PEN**

GEORGE BLISS, Genl Mgr  
220 NINE ST. CHICAGO, ILL.

**DUPLICATING PRESS**

E.T. GILLILAND,  
Genl Eastern Agent

20 NEW CHURCH ST.

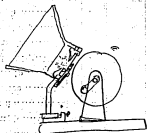
NEW YORK \_\_\_\_\_ 1877.

Herewith we hand you a Descriptive  
Pamphlet of our process for the reduplication of your own hands writing  
with the Electric Pen, and also specimens of workmanship.  
We are especially desirous of calling your attention to the many ways  
in which it can be utilized in all mercantile houses to great advantage,  
combining both a labor and money saving apparatus.  
General Salesmen have found it indispensable when special inducements  
are offered in certain lines of goods, or when special sales are to be  
made, as also in the offices where circular letters, blank forms, &c are  
required, in cases where fluctuations are rapid, it has proved of great  
value, inasmuch as Three or four hundred copies of the matter written,  
can be duplicated, and prepared for distribution in an hour, we claim  
superiority to all processes for duplicating, our advantage consisting in  
the fact, that after the matter is written it can be instantly placed in the  
Press, and without further preparation, an office boy can take any num-  
ber of copies desired, each letter is clear and distinct with no blurring at the  
intersections of the lines of the letters.  
The simplicity in the construction of our apparatus enables any person to  
operate the same with as much freedom as an ordinary Pen.  
Any number of copies from 1 to 10,000 can be taken from a single  
writing at the rate of 10 a minute. We would commend it to your favor-  
able consideration and will be pleased to furnish you any further in-  
formation as to its merits &c

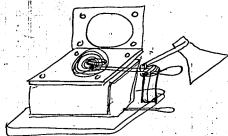
Very Respectfully

E. T. Gilliland,  
Genl Eastern Agent

Geo. H. Bliss  
General Manager



also make this just like the  
Illustration =



But make drawing of  
our new phone. make complete  
model with the title and with  
figure 1 & show it just as we  
are going to make it.

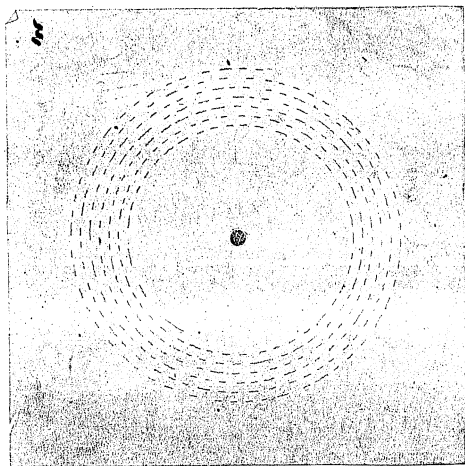
Model.

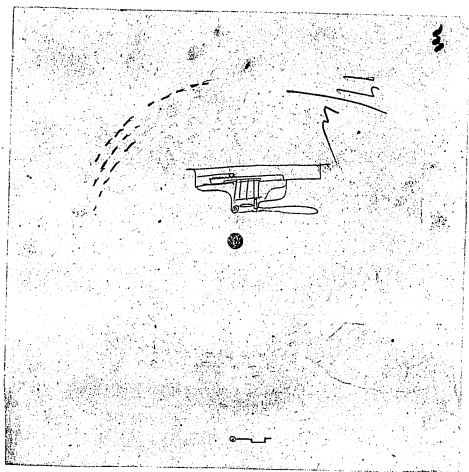
**SUPPLEMENT TO PART I**

**1877**

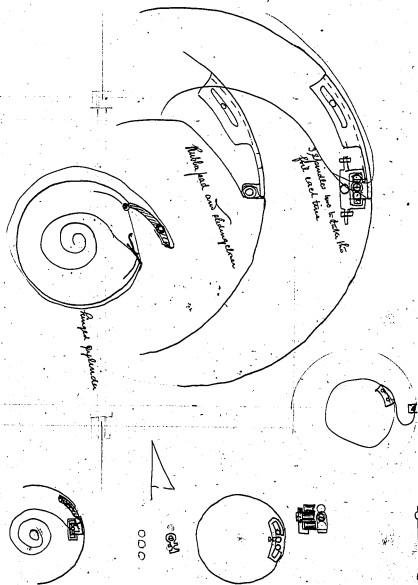
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The remaining extant pages can be found on reel 4, frames 874-1044.

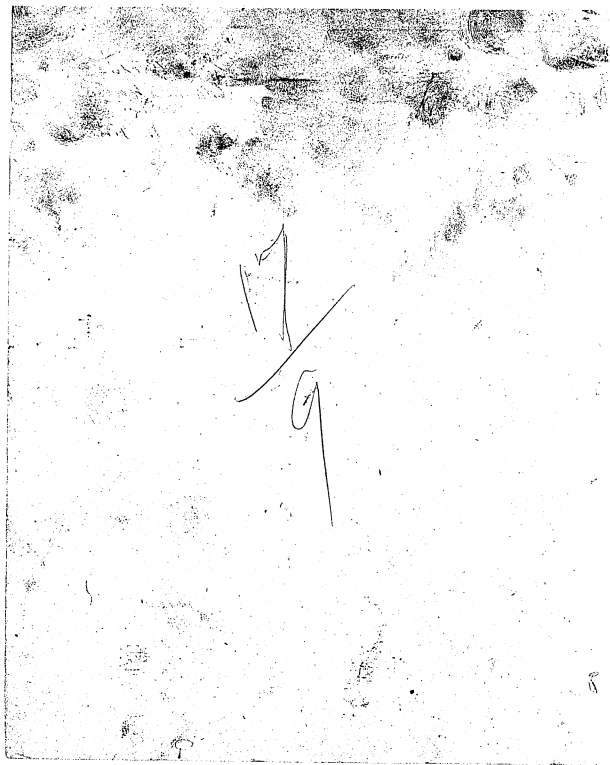






Photograph 127  
 The Wilson  
 Cha. Ratcheter  
 Johnson  
 M. N. Force





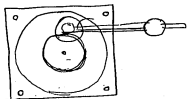
Photograph—

Dec 23 1877.

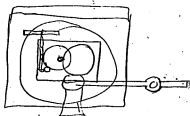
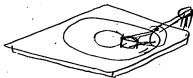
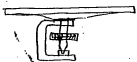
T A Edison

Chas Batchelor

J. K. Meece



Volume



7/11/11  
10:30 AM

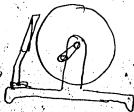
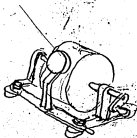
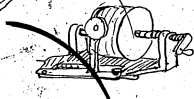
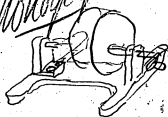
11/11/11

17/8/11

11/11/11

Mr. Edwin Dyer  
Organ Union

Monograph



Jan 8 1878  
At a Court  
Chapman  
Johnesi  
25 Court  
New York



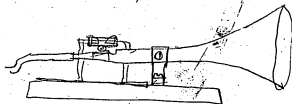
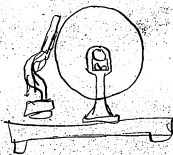
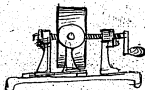
17/32



Phonograph

Feb 7 1875  
7a Edwa

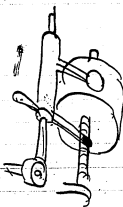
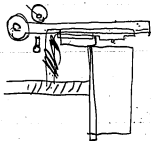
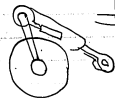
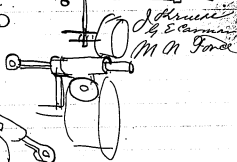
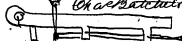
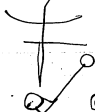
Chas. B. Batschelt  
Johnston  
M. H. Ford  
N. H. Edson



17  
48

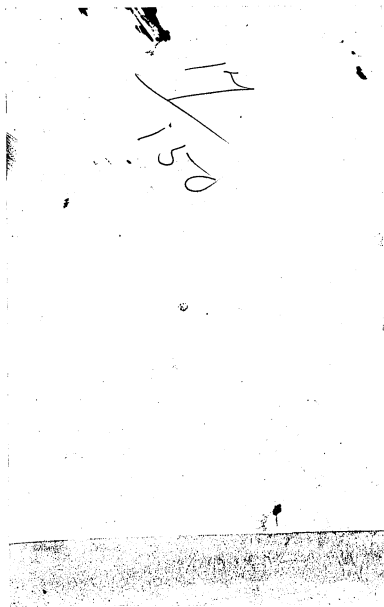
T. A. EDISON.

Photograph  
J. A. Edison  
Menlo Park, N. J., Oct 8 1878  
Chas. Batchelor



Personally appeared before me this  
18 , the said T. A. Edison,  
Chas. Batchelor, John Kresal, and Martin Perth,  
and acknowledged the above to be their signatures

Notary Public



**SUPPLEMENT TO PART I**

**1878**

A m 711ayer  
Feb 9. 78

Stevens Institute of Technology.

HOBOKEN, NEW JERSEY.

Feb 9. 1878.

My dear Mr Edison;

Your talking phonograph  
reached the Institute safely. I have made  
some experiments with it. Not many, for  
my time since its arrival has been almost  
constantly engaged in my duties as Prof<sup>r</sup>.

I have obtained several magnificent  
traces <sup>on smoked glass plates</sup> of the inflections on the first. The  
~~same~~ some sound that reaches then I have  
also sent into King's resonant flame  
apparatus, and have made accurate drawings  
of the form of the vibrating flame. There is,  
so far as so few experiments warrant, in  
me believing that there is a general correspondence  
in the form. The word "bet" I have  
studied with some care, and especially  
the a sound in that word. The flame  
gives this figure for the a.

He came for phonograph.

showing a general  
correspondence

such work is exceedingly difficult for the  
house and the <sup>photographer</sup> ~~photographer~~ days as much with  
the pitch and quality of the visa, and  
it is very difficult to bring into both  
instruments in exactly the same manner.

I wish I could see you for a  
few moments to learn what is new about  
the phonograph. for I wish have an  
illustrated article on it, out in about  
2 weeks. and I naturally wish all I  
can get from you to make the information  
it contain up to date.

Could you not favor me with a  
concise account of what you have done  
since I last saw you, & put it in such  
form that it could be published in my  
article?

With many thanks for your kindness  
and interest towards me I remain

Yours very truly  
Alfred M. Hayes

Blank No. 1

# THE WESTERN UNION TELEGRAPH COMPANY.

Whereas of this Company receive that all messages received for transmission, shall be delivered as the Western Union  
at the Company's office and subject to the conditions printed herein, which shall have been agreed to by the sender of  
the following message:

No 1

WILLIAM GRYTON, Pres<sup>nt</sup> New York  
A. M. BREWSTER, Secy.

Dated Cable July 1, 1878

Received at \_\_\_\_\_

By Edison

Memo Paris

waiting for promised small  
Phonograph cable cases  
if thousands ordered

Pres Lag

14 London



New York, Feb'y 18th, 1878.

Dear Sir,

Having secured the sole right to Exhibit the various Telephonic and Phonographic inventions of Mr. Thomas A. Edison and having arranged with him to receive simultaneous with its production any improvement incidental to their development; I am prepared to inaugurate a Series of Exhibitions, instructive and entertaining, to a superlative degree, on point of fact rarely if ever equalled in its power to attract and interest all classes of an intelligent Community.

My present Outfit includes the following:

Edisons Speaking Phonograph.

Edisons Musical Telephone.

Edisons Speaking Telephone.

Each of which are unequalled in respect to their capacity to perform the work for which they are designed.

The Speaking Phonograph.

This invention, an absolutely new discovery, I place first in order, because it is unquestionably the most important in its beneficent effect upon the progress of Science and human industry, of any invention of late years. Such is the verdict of the many eminent Scientists who have examined it.

By it I will entertain an audience as follows:

Recitations, Conversational remarks, Songs (with words) Connet Solos, Animal Mimicry, Laughter, Coughing etc, etc, will be delivered into the mouth of the machine, and subsequently reproduced by the machine with such fidelity of tone, Articulation, Emphasis, etc, as will kindle an enthusiasm as readily as it will be spontaneous, and by reason of the simplicity of the apparatus, a clear and concise explanation of which is given - early conviction at once to all that the Apparatus is really a great discovery and not a mean trick or toy for producing deceptive effects - the known reputation of Mr. Edison as a producer of practical inventions so however the best guarantee I have to offer of the genuineness of this great discovery.

The Speaking Telephone.

This invention I rank next in order because of its relative commercial value and Scientific interest, though for purposes of public Exhibitions & entertainment it is not well adapted by reason of the fact that the volume of sound it gives is too limited for contributing enjoyment to a large Audience. In order however to illustrate the practical use of the Speaking Telephone in a striking manner I use this Instrument in the presence of the Audience to direct my assistant at the farther end of the wire as to the order of the Musical programmes, for transmitting to him Encores, and otherwise to keep him and the Musical Artists advised as to the pleasure of the Audience.

*I found this unmentioned  
most apt* E

### The Musical Telephone

This invention is the most novel and has far greater capacity for interesting and entertaining an audience than all the telephonic devices of other inventors combined. It is not operated by an Electric magnet as are all other telephones, but upon an entirely new principle of Electric Chemical action, pronounced by eminent Scientists as an original discovery in the Electrical science. The capacity to reproduce and make clearly audible Telephonic (musical) sounds given to this instrument by this new principle renders it absolutely the only apparatus in existence by which vocal and organ notes can be transmitted from a distant point to an Audience Hall and there reproduced in a manner at once readily heard by all, however many there may be, and in an enjoyable manner.

### The Explanatory Lecture

This part of the Entertainment is made to suit the spirit and humor of the Audience, but is mainly confined to clear, simple explanations of the Modus Operandi of the several apparatus, and if apparently satisfactory, to a very brief sketch of the history of the development of the inventions. No scientific dissertation on the laws and theories of Sound, or other prolix and tedious consumption of time by the speaker. My object is simply to show and make intelligible what I show. As to the details for your guidance in the preparation and advertisement of my entertainment I submit the following general directions.

### Order of Programme. 1st Part.

The Musical Telephone, with Speaking Telephone as auxiliary.

### 2nd Part.

### The Phonograph

#### Specific Directions - Telegraph Line -

Length of line which may be operated 1 to 100 miles.

Battery required for its operation 20 to 100 cells.

#### Conditions essential.

A wire absolutely free from Telegraphic apparatus. a single wire connecting the Hall with the main wire - a looped wire to connect the singing station with the Telegraph office or Battery.

Permission for the free use of wire and battery can generally be had by application to the W. U. Telegraph officials they having always evinced a commendable public spirit in this regard, especially in relation to Mr. Edison's improvements. Railway Companies may also be applied to effectively.

#### Musicians.

#### At the Singing Station.

1 Tenor. 1 Soprano. 1 Cornet Soloist. all of the text to be had as the apparatus shows the execution of the Artist. A greater number of artists are an impediment.

In selecting Artists regard should be had to their reputation in the City in which their voices are reproduced, their style of execution is frequently recognized, which has a telling effect. The Soprano especially should be of a high order of merit. These Artists can usually be had as volunteers, they being attracted by the novelty.

### The Phonograph.

This being a purely mechanical apparatus and hence operated locally does not require the use of wires etc. I therefore make it the second part of the entertainment, thus dismissing the singers, and yielding up the wire at an early hour - usually about 9.15 P.M. I require for its proper Exhibition no paraphernalia of any sort - and only a good singer and Cornet player to sing and play into the mouth of the Machine, upon the stage in presence of the Audience, these are not indispensable but they add to the attractiveness of the Exhibition.

### Advertising.

The large Posters should have prominently the general features herein contained. But small hand bills should set forth in considerable detail the points made - and be well distributed. The local papers should insert as squibs the various points and comments as to the fulfillment of these promises culled from persons whose I have exhibited - such a course of advertising invariably pays largely.

I usually reach the City several hours in advance of the opening of the entertainment and make a preliminary test or rehearsal as early as the wire can be obtained. It is well to have reporters present at this rehearsal.

My terms are \$100 per night - and comprehend all the necessary apparatus, myself and one assistant.

I carry 1000 feet of insulated office wire for connecting my instruments with the outside wire previously brought to the Hall window.

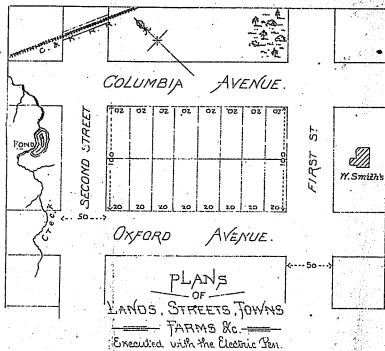
On selecting the Singing Station first ascertain if Battery is obtainable.

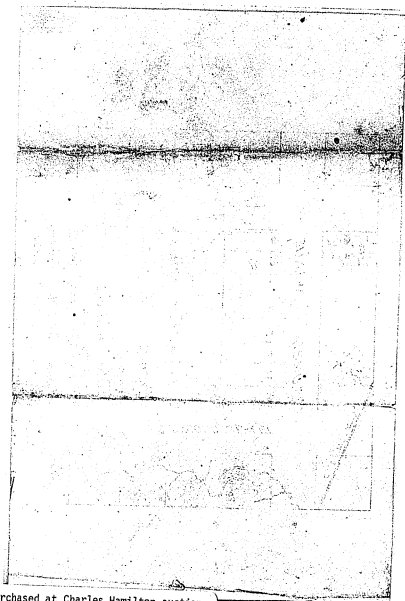
Any small room handy to the Battery or Telegraph Office suffices for the Singing Station.

Yours Very Truly  
Edward H. Johnson

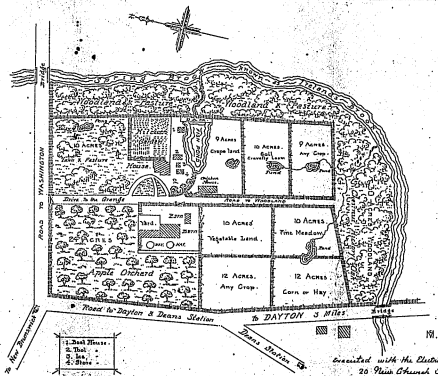
20 New Church St. N.Y.

1. 100 ft. wide  
 2. 100 ft. wide  
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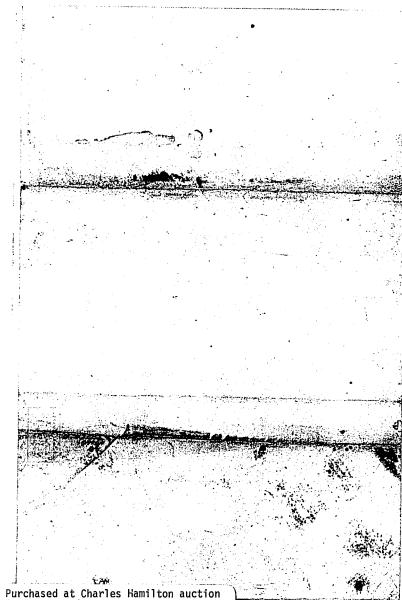




Purchased at Charles Hamilton auction  
August 1984 (funds contributed by  
Charles Hamilton Fund.) NOT ON  
MICROFILM Part 1.



Executed with the Electric Pen  
20 Main Street, N.Y.



Purchased at Charles Hamilton auction  
August 1984 (funds contributed by  
Charles Edison Fund.) NOT ON MICROFILM  
Part I.

G. B. Hubbard  
Feb 23. 78

BELL TELEPHONE COMPANY.

Factory, No. 109 Court Street, Boston.

GARDNER G. HUBBARD, Trustee,  
Washington, D. C.

Washington, D. C. Feb 22, 1878

Mr. A. Edison Esq

Dear Sir

I have requested  
one or two parties to say  
before that I thought Prof.  
Bell with his English  
we would do better with  
some Phonograph than  
any one else, & if you  
think so, I should  
like to know on what  
terms he could have it  
& I would then con-

municate with him -

Prof Bell has a high re-  
gard for Mr Edison as  
a most accomplished  
Electrician, & wonderful  
genius.

I trust our phono-  
graphs are turning  
on & that soon we  
can introduce them to  
the world.

Very respectfully  
Andrew S. Hubbard



New York, Nov. 2<sup>nd</sup> 1878  
Dear Sir: Your favor of \_\_\_\_\_ received,  
in regard to the speaking Phonograph invented  
by Mr. Thomas A. Edison.

At present we are not ready to furnish any  
Phonographs, but expect to be in position to fill  
orders within a few weeks, and will inform you  
as soon as we are prepared to attend to your  
requirements.

Yours respectfully,

P. O. Box 5520, New York City.

THE PHONOGRAPH COMPANY



WRITE THE ADDRESS ON THIS SIDE—THE MESSAGE ON THE OTHER



*Mrs. H. Batchelor Esq*

*235-91 Chetham Street*

*Manchester*

*England*

# Universal Exposition of 1878, at Paris.

OFFICE OF THE UNITED STATES COMMISSIONER-GENERAL.

Room No. 34, POST OFFICE BUILDING.

CIRCULAR TO EXHIBITORS.

No. 8.

NEW YORK, March 9, 1878.

Exhibitors who have not filled up and returned to this office form No. 4, "Information for the Jury," should do so as soon as possible. If they have failed to receive this form, which has in all cases been sent to them by mail with their permits for space, they should at once notify the Commissioner-General of the fact.

R. C. McCORMICK,

*Commissioner-General.*

TITUSVILLE, PA., MAR. 14, 1878.

THOMAS W. EDISON, ESQ.,  
NEWARK, N. J.,

DEAR SIR:

CAN I OBTAIN FROM YOU A PHOTOGRAPH? IF SO, AT  
WHAT PRICE? I AM AWARE THEY ARE NOT YET IN THE MARKET, BUT HEARING  
OF SOME WHO HAVE THEM, AND BEING MUCH INTERESTED IN TELEPHONIC AND  
KINDRED SUBJECTS, I MAKE THIS INQUIRY. A REPLY WILL MUCH OBLIGE.

RESPLY.

F. T. F. LOVEJOY,

TITUSVILLE,  
PA.

*Send him a Card*

783 George  
Mar 14/1878

## ELECTRICIAN'S DEPARTMENT

WESTERN UNION TELEGRAPH COMPANY

NEW YORK *Dec. 15* 187*8*

GEORGE B. PRESCOTT,

ELECTRICIAN.

*Friend Edison*

I am completing your telephonic and phonographic articles for my book describing the instruments as they now are completed. I shall publish Bell's lecture in full & give our account of his telephonic inventions. In order to make the subject complete I would like to publish your own account of your telephonic inventions from the beginning. These three accounts from the three telephonic inventors written by themselves would possess a peculiar and valuable interest. Will you undertake to do it?

Yours truly  
Geo B Prescott

913 Prescott

Mar 15 1878

My dear Sir,  
I have the honor to acknowledge the receipt of your letter of the 11th inst. in relation to the matter of the  
estate of the late John D. Prescott, deceased, and in reply to inform you that the same has been forwarded to the  
proper authorities for their consideration. I am sorry to hear that you are unable to visit  
at the present time, but I trust that you will be able to do so at a later date. In the  
meantime, I will endeavor to do all in my power to expedite the matter.  
Very respectfully,  
J. D. Prescott

Menlo Park March 15 - 75

Chas A. Cheever.

~~My~~ Please give bearer one hundred and seventy five  
dollars I want to pay my men

Yours Edison

Menlo Park N. J. March 15 - 1875

Received of Chas A Cheever One hundred  
and seventy five dollars on account of  
Phonograph Contract.

Thos A Edison

Dead but tonight will send  
it out by Johnson in the  
morning sure  
3 P.M. Yours  
Chas A Cheever



Eachway  
Mar 15. 78

[TO JOHN SHINN]

*Card* **FRANKLIN INSTITUTE.** 30

*Philadelphia, March 16th, 1878.*

The next Stated Meeting will be held at the Hall of the Institute, on Wednesday the 5th inst., at 8 o'clock, P. M.

The Secretary's Report will embrace illustrated descriptions of Edison's Speaking Phonograph; Edison's Carbon Telephone Transmitter; Dwyne's Caustic Battery; The American Burglar Alarm, and other mechanical novelties.

The Amendment to Art. XVI of the By-Laws, relating to "Amendments," proposed at the last meeting, will come up for action.

Please leave this notice or your card at the door.

**J. B. KNIGHT, Secretary.**

A Class in PHOTOGRAPHY will be opened at the Hall of the Institute, on the 18th inst., at 8 o'clock, P. M., and continued on succeeding Monday evenings for twelve weeks.



WRITE THE ADDRESS ON THIS - OR THE MESSAGE ON THE OTHER -

Mr. Chinn  
229 E. Franklin  
Levy

J. A. E.

I do not know whether you have tried any device such as I am about to describe, if you have all right, and if not, it may be useless, but if good for anything use it.

The rubber at the end of a tube compressed to form a narrow opening, with the point attached at one side, so that the ten foil impressions will open and close the slot, and place this as the mouth-piece of a trumpet, blowing air through the tube, thus,

the puff of air will upset the  
the foil indentations, <sup>into the</sup> <sup>current of</sup> <sup>air</sup>



Another idea has occurred to me.

a. flexible tube for air blast.

b. spring carrying a dia-

phragm c. and

a point for foil.

diaphragm <sup>of</sup> with a  
hole for air to blow through and re-  
ceive its vibration from the dia-



Microgram and phonograph

June 20 1911

L.M.P.

file phone

86-31-1000  
8-11-11

JWS Arnold  
Mar 20. 78

March 20<sup>th</sup> 1878

410 East 2<sup>nd</sup> St.

Mr Edison

My dear Sir

Enclosed please find  
tickets to the lecture for Saturday  
evening. I shall be happy to have  
you occupy a seat upon the  
stage, and will take great  
pleasure in presenting you to  
the audience.

Very truly Yrs  
JWS Arnold

Friend Arnold - I have received  
many thanks. I would not face an  
audience for 100 dollars the  
reporter that come down here  
have already unstrung my nerves  
that I think of taking to the woods  
for Edison

[POSTMARK: MARCH 21, 1878]

My article <sup>has</sup> appeared in the April  
no. of Prof. Sci. Monthly.  
I hope that it will please  
you & prove of it necessary  
and chairman. I do not  
know how Prof. B. knows so  
much about my affairs. He has  
taken experiments over and talks  
up.

Many thanks for your letter  
just received. I am arranged  
to go on. I will soon come  
at and shall not you of another  
half day at least.  
Sincerely,  
Mayr



WRITE THE ADDRESS ON THIS SIDE - THE MESSAGE ON THE OTHER

*Mr. Mrs. A. Edison*  
*Merulo Park*  
*Penns. R.R.*  
*New Jersey*



New York, N.Y. 28/78.  
Thomas A. Edison &

Dear Mr. In accordance with  
the terms of our contract, with your  
your written consent to the sale of  
Our No 1. Experimental apparatus  
@ \$30 Each. and the No 2 @ \$60. Each  
is essential before we can proceed.  
Please let us have it by return mail.

Yours Truly,  
Edison  
Agent

E  
I have been fully over the price for  
No 2. & find we cannot sell it for less  
than \$60. I do not want to ask more,  
than will give us a good profit - as I  
think it desirable to keep the price as much  
below the "standard" as possible.  
Yours Truly

[APRIL 5, 1878?]

Will E Chapman

Phila.

Will be on hand on number  
Seven or Eight Saturday Evening

11

~~W~~ Collier

J. A. Edison

Blank No. 2.

## THE WESTERN UNION TELEGRAPH COMPANY.

This Company TRANSMITS and DELIVERS messages only on condition, limiting liability, which has been described in the charter of the following message:  
Messages are sent under no responsibility for accuracy, except back to the sending station for correction, and the Company will not be held responsible for any loss or damage to property or other loss of messages.  
The message is sent UNDER GUARANTEE and is delivered by report of the sender under the conditions mentioned.

A. R. BREWER, Sec'y.

WILLIAM ORTON, Pres't.

Dated New York Sept. 6<sup>th</sup> 1878

Received at

To J. A. Edison

READ THE NOTICE AT THE TOP.

Mr Johnson will  
write article, upon signature  
to it indispensable. please  
consider the character of  
our readers, and allow  
him to use it. Reply to  
North American Review

39 paid

*K. Amos Revision*

*file -  
Nunapopials*

North American Review,  
N York

Sent to Zetzel's Apr 8 '78

All right could I see proof early Monday  
morning -

J A Edison

Edison Speaking Phonograph Company.

E. H. JOHNSON, General Agent,  
P. O. Box 5520.

New York Oct 17 1878

Thomas Edison Esq

Dear Sir:

If you  
in New York today don't feel to  
call at Tribune Building

Respectfully  
Yours

E. H. Johnson  
Per Letter

G. H. Johnson  
Mar 12.

filed

Tribune Building N.Y. April 12/78

Thomas Edison Esq

DEAR Sir:

If you are in  
New York today dont fail to call  
at Tribune Building

Respectfully yours

E. H. Johnson  
Per Lule



E H Johnson  
am 12

Referred to W. O. Weston  
for his information especially  
on the other side of the shield  
than built in for Bell Telephone Co.  
1 Edison

Placerecurus

Boston Sunday April 14, 1878

Dear Friend Edison

Herewith I send you a slip cut from  
today's (Sunday) Boston Herald containing a very interesting  
notice of your "Royal Hats" I notice the absence of the  
history of that "Mid State Hat" you bought a few days subsequent  
to your arrival in Boston in '68 since that having been first  
set by that Horseman the Saturday night you accompanied myself  
to the fire on Merchants Row, "Held on 11<sup>24</sup>"

so much for old times but now to business -

Frank Hannaford and myself have had all we could handle  
for several months building lines for Telephonic purposes  
one great obstacle we have met with is the induction which  
is found in lines running on the same poles & through  
the same cables. I have presented a plan for connecting  
the Mills at Lowell & Lawrence by Telephons with their  
agencies in Boston to the Corporation Treasurers Rev with  
whom I am intimately acquainted they think favorably of  
the project but I have seen fit to allow the matter to  
rest at present on account of the induction. We have  
built a few lines with improved Compamel wire 3 and 5  
miles in length & find much less induction than from

\*9 Galvanized Iron wire of course this is partly explained  
in the superior Conductivity of the Copper over Iron  
I presume that we could overcome the induction in this  
wire on a 2 wire line from here to Lowell. (26 miles)

Ground 1 wire at Boston & at Lowell  
+ Make a loop of the other wire running the wire from Boston  
to Lowell + return - the down back being the extra  
cost of \$800 + \$900 for return wire

To a Mind like yours this may seem unworthy of  
notice but my humble advice is if you can possibly  
find time look into the matter and if you can  
perfect a telephone that will overcome this induction

I can prove to you that there is money in it.  
within 11 months there has been one hundred and twenty  
private lines built in Boston & its suburbs for telephone  
purposes - Bell people are worried about this induction  
(Confidential) and have tried night & day to overcome it  
but as yet without success - They shipped several large  
boxes of telephones to China last week - Chas Williams Jr  
wq could not make them for Bell - he employs 100 or 125 men  
& has manufactured nearly 9000 so far

Yours Truly

Dennis J. Hearn

- Gas A. & P. Office Boston -

THE  
Edison Speaking Phonograph Company.

E. H. JOHNSON, General Agent,  
P. O. Box 5231.

New York, Sept 19 1878

My N Edison

What is Modus Operandi  
of your Clock work  
Can I anticipate the  
method of its attachment  
to my Phonos? so as  
to save my Customers  
Expense & trouble in  
attaching when we are  
prepared to supply them  
Reply quick Else it will  
be too late to have  
anything done to the Machine  
E.H.O.

Ellen  
W. G.

de Haas

## Edison Speaking Phonograph Company.

E. H. JOHNSON, General Agent,  
P. O. Box 829.New York, Apr 25 1878Thomas A. Edison &  
Sons

I am informed that by granting permission to exhibit the Phonographs at a Jersey City Sabbath School free of charge - I can promote the interests of a Sabbath School at Menlo Park in which Mrs Edison is interested. In such case it gives me pleasure to extend the permission on behalf of the Edison Speaking Phonograph Co.

Yours Very Truly  
E. H. Johnson  
General Agent

Ed Johnson  
Apr 25. 78

J. C. McCellan



246 Int  
\$ 200<sup>00</sup>  
No 207 46

Newark, N.J.

April 25 1878

Two months after date I promise to pay to  
the order of William H. Kirk

Five

Two Hundred  
with interest  
for value received at Mechanics National Bank at  
Newark N.J.

No Due

Thomas A. Edison

United States Treasury & Finance, Series 17



Manager,  
WILSON & L. ROSSWELL,  
CHARLES A. CROSBY.

P. O. Box 5529.

THE TELEPHONE COMPANY OF NEW YORK.

89-THURMAN-BUILDING,  
203 Broadway

New York, April 29<sup>th</sup> 1878

Dear Edison

Am sorry that I did not see you today when you called, as I wished to introduce you to the large apartment which I have set apart as a private sanctum for your royal self. I more especially regret this as I learn you are to write a letter to the Graphic to be photo-lithographed & I should like to have seen it headed "Office of Thomas A. Edison" 203 Broadway N.Y."

Yours Truly  
Chas. A. Heever

file. phone

Chas. C. Brown  
Lynchburg

May 8th 78  
When tin foil comes, deliver  
it to L. A. Ludwig C. N. D.  
297 Broadway. He will ship it  
by next store. I prefer this,  
as what I have will answer  
until next store arrives. S. J. S.



WRITE THE ADDRESS ON THIS SIDE - THE MESSAGE ON THE OTHER



Thos. A. Edison, Esq  
Menlo Park  
N.J.

Menlo Park May 13. 1878

E A Lindberg Esq

Dear Sir

we have shipped to your <sup>address</sup>  
address via Penn R.R. 25<sup>th</sup> Int foil as per  
request of J. Smith. please acknowledge receipt  
for same

Yours truly

J A Edison

per

J A Edison Esq

Dear Sir

this am

Plly Int foil to hand

very truly yours

L A Ludwig

to a finding

Clarence G Blake

May 24. 701

19 St James Ave

Boston

Will be home Sunday Come on

J A Edison

G. C. C. C. C.

May 30<sup>th</sup> 1888

Mr. Edison

The Tinfoil which came to-day  
is one quarter of an inch shorter  
than usual.  
It could not be used on the Laughlin's  
Phonographs.

J. Thuesen



J. Krenn

1872

Went Park nJ may 31. 78  
H C Townsend—  
Care John Reynolds 9 Pine St NY

Come too day

70 Edison

June 4<sup>th</sup> / 78

Hussey

Give this gentleman a  
ticket

100

J A Johnson

Ans:q

5<sup>th</sup> June 1878

Please give bearer tickets to my

J. J. Oliver

# THE COMPLIMENTS

of the  
Delaware, Lackawanna & Western Railroad Co.,  
New-York and Long Branch Railroad Company,  
Freehold and Asessing Railroad Company,  
Central New-Jersey Railroad Company,  
West Jersey Railroad Company.

*Thomas A. Wilson*  
A MEMBER OF THE

New-Jersey Editorial Association.

250

To Freehold and Spring Lake.  
June 17th to 22d, 1878.  
If Registered and Not Transferred.

Del., Lackawanna & Western R. R.,

PASS DELEGATE OF THE

New-Jersey Editorial Association

From

TO NEW-YORK,

AND RETURN,

JUNE 17th to 22d, 1878.

250

Coupon not good if torn off by 3  
any one except Conductor.

Central New-Jersey Railroad,

PASS DELEGATE OF THE

New-Jersey Editorial Association

From

To *New York*  
*Spring Lake*

AND RETURN,

JUNE 17th to 22d, 1878.

250

Coupon not good if torn off by 2  
any one except Conductor.

New-York and Long Branch Railroad

PASS DELEGATE OF THE

New-Jersey Editorial Association

From New-York to Spring Lake,

AND RETURN,

JUNE 17th to 22d, 1878.

250

Coupon not good if torn off by 1  
any one except Conductor.

Camden and Atlantic Railroad,  
PASS DELEGATE OF THE  
**New-Jersey Editorial Association**

From.....  
TO PHILADELPHIA  
AND RETURN,  
JUNE 17th to 22d, 1878.

**250** Coupon not good if torn off by  
any one except Conductor. 4

West Jersey Railroad,  
PASS DELEGATE OF THE  
**New-Jersey Editorial Association**

From.....  
TO PHILADELPHIA  
AND RETURN,  
JUNE 17th to 22d, 1878.

**250** Coupon not good if torn off by  
any one except Conductor. 5

Freehold and Jamesburg Railroad,  
PASS DELEGATE OF THE  
**New-Jersey Editorial Association**

FROM HOSKING JUNCTION  
TO SPRING LAKE,  
AND RETURN,  
JUNE 17th to 22d, 1878.

**250** Coupon not good if torn off by  
any one except Conductor. 6

New-Jersey Southern Railroad,  
PASS DELEGATE OF THE  
**New-Jersey Editorial Association**

From *New York*  
To *Philadelphia*  
AND RETURN,  
JUNE 17th to 22d, 1878.

**250** Coupon not good if torn off by  
any one except Conductor. 7

Conductor will punch the Pass for his  
Road in going to, and take up on re-  
turn from Highlands and Spring Lake.



NEW-JERSEY EDITORIAL EXCURSION.

PAVILION HOTEL, HIGHLANDS:

Entertain *Thomas A. Edison*

From Monday Evening, June 17, to Thursday  
Morning, June 20, 1878, and charge to The Editorial  
Association of the State of New-Jersey, as per agreement.

250

*John D. Balcock* Secretary.  
The person holding this check must deliver it to the Hotel Clerk  
on first entering, and before obtaining Room Keys.

NEW-JERSEY EDITORIAL EXCURSION.

MONMOUTH HOUSE, SPRING LAKE:

Entertain *Thomas A. Edison*

From Thursday Evening, June 20, to Friday  
Afternoon, June 21, 1878, and charge to The Editorial  
Association of the State of New-Jersey, as per agreement.

250

*John D. Balcock* Secretary.  
The person holding this check must deliver it to the Hotel Clerk  
on first entering, and before obtaining Room Keys.

George B. Prescott  
Electrician

Electrician's Office  
Western Union Telegraph Company

New York, June 14<sup>th</sup> 1878.

J. A. Edison, Esq.,  
Dear Sir,

I am about to publish a new edition  
of my recent work on the telegraph, <sup>photograph</sup> but before doing  
so want to add a new chapter so as to include all  
of the improvements that have been made since the  
first edition was printed, my intention being to have the  
new one contain everything in the telegraph and photograph  
line up to date. I wish you would send me all  
you can bearing on the subject, details of your  
experiments etc, etc, as early as convenient so that  
I may get at the facts and give you full credit.  
Should also be glad for any newspaper articles  
that will tend to elucidate matters.

Yours Truly,

Geo. B. Prescott



NY June 19 78  
Prescott

On 19 June 2074

Jas Respath  
Gen Manager.  
P. O. Box 8820.

The Edison Speaking Phonograph Company,  
203 BROADWAY,

New York, June 22nd 1888.

T. A. Edison Esq. Menlo Park N. J.

Dear Sir,

Enclosed please find a letter to Mr. Palmieri written at his request. If it meets your views, please confirm it by addressing me a letter in which you will grant him these rights, which I can show to him. Specify also whether British Guiana can be included. Mr. Cheever suggested that it might, some time since. As I do not know who has the right of supplying the machines to go to the West Indies, I put in in that sentence about your indicating the price of them. Please return the enclosed letter when you write to me.

Of course it will be necessary for you to sign the letter with your own hand.

Yours truly Jas Respath  
Gen Manager

Jan Report 24      June 24

Referring to the Palmeri matter - let  
Mr Price Mr Chever about British  
Tunisia - I do not wish to change  
existing arrangements with Mr P  
let him go and exhibit and not  
sell into - Please inform me when  
you clear matters as I have other  
applications for that territory

T.A.E.

## The Edison Speaking Phonograph Company,

203 BROADWAY,

New York, July 1<sup>st</sup> 1878

Sir

A special meeting of the  
 Directors of the Edison  
 Speaking Phonograph Company  
 will be held at the office of  
 the Company No 203 Broadway  
 New York on Saturday July 6/78  
 at 10 o'clock A.M. for the  
 transaction of such business  
 as may properly come  
 before them

By Order of }  
 The President }  
 Thomas A Edison & }  
 New York }  
 N.B. Please acknowledge  
 receipt E.H.

Notice of Meeting  
Phono Co  
July 6-78

T. A. EDISON,

Menlo Park, N. J., ..... 187

Mr Hussey Please give train  
Excursion ticket to NY  
July 1st/8 Edison

The Direct United States Cable Company, Limited

16 Broad Street,

New York. 24 July 1878

T. A. Edison Esq:  
Menlo Park  
N.J.

Dear Sir

The following message has been received today for you & any reply you may wish to send, will be forwarded

Yours truly  
Geo. G. Hand Esq  
Jas

To Edison

Is India mentioned in  
"Puskas contract, if not send me power  
"Attorney, have desirable party

Gouraud

London July 26<sup>th</sup> 98.  
Gomara  
Regarding India  
& Puskas Contract



T. A. EDISON.

No 1 ——— 9th

Menlo Park, N. J., Aug 10 1878

Virginia City near 9<sup>th</sup> 78  
S. L. Griffen Menlo Park  
Better send scientific Americans  
August tenth to regular list in  
Europe  
Thos A. Edison

11 A. H.  
J. H.

City of New York }  
County of New York. }

I Oliver D. Russell being duly sworn do depose  
and say, that neither I nor any one else authorized by me, has  
made, sold or delivered any Toy or Toys such as are described in  
the contract entered into between Thomas A. Edison and myself  
January 7<sup>th</sup> 1878. And further, that due diligence has been exerted to  
render the Phonograph applicable to the Articles enumerated therein,  
and that when so perfected, which I am faithfully trying to do, true  
and correct returns shall be made under oath every month to the  
said Edison, of all sales of such apparatus-

Oliver D. Russell.

Sworn to before me this }  
15<sup>th</sup> day of August 1878 }  
Thos. Ryan  
Notary Public

**Nemuel W. Serrell's**  
OFFICES FOR PROCURING  
American and Foreign Patents,  
76 CHAMBERS STREET,

(P. O. Box 488.)

New York, Aug 29 1878.

T. A. Edison Esq

Dear Sir

I understood that the phonograph model left here was for two U. S. Applications, they are ready for your examination

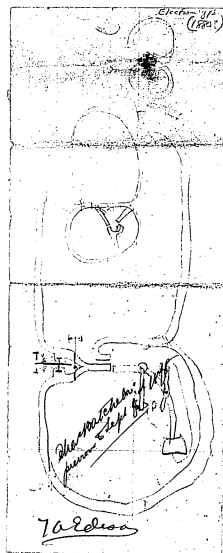
Canada will need a similar model and the two can be taken in one patent there:

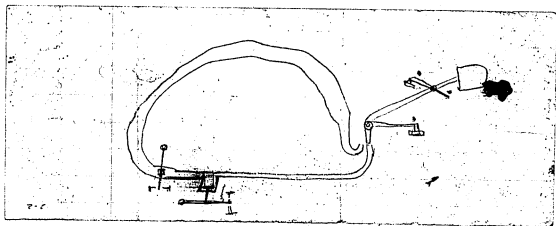
Several items need your attention, Please let me know when you will be here - I may have to be in Philadelphia tomorrow.

Yours truly

Nemuel W. Serrell

Ans'd Aug 30 '8





T. A. EDISON.

Menlo Park, N. J., Sept 4 1878

Am Hunted  
ny

Yes thirty six will do  
German silver T A Edison

727  
1021  
9 26 21

T. A. EDISON.

~~66~~ 3

Menlo Park, N. J., Sept 19 1886

Mr. Eaton

65 Henry St Brooklyn NY

All right come ahead

T. A. Edison

5 Collect



[SEPTEMBER 21, 1878?]

T. A. EDISON.

2

Menlo Park, N. J., 21 187

Tracy R. Edison  
N.Y.

Cant come over today,  
cant you come out  
next monday or  
tuesday

T. A. Edison

17 R.H.



142 DuSalle St.

Chicago

1878.

SEP'T 26TH,

THOS. A. EDISON ESQ.  
MENLO PARK, N.J.

DEAR SIR:

PLEASE GIVE ME THE NAMES OF THE VARIOUS INVENTIONS YOU HAVE MADE OR PLANNED PERTAINING TO SOUND SINCE COMMENCING YOUR RESEARCHES ON THE TELEPHONE AND GIVE FEW WORDS OF DESCRIPTION OF ANYTHING WHICH I HAVE NOT SEEN.

I HAVE BEEN INVEIGLED INTO A PROMISE TO DELIVER A LECTURE SOON AND WANT TO GO OVER THE GROUND GENERALLY IN CONNECTION WITH THE PHONOGRAPH &C.

RESPECTFULLY,

*Geo. H. Bliss*

GEN. MAN.

Megaphone  
 Aerophone;  
 Telephane;  
 Auriphane  
 Microphone,  
 phonograph  
 Phonograph  
 great phone  
 Compressed air speaking machine  
 for deaf people not perfect

Sept 26 78

T. A. EDISON.

Menlo Park, N. J., Sept 27 1878

B. S. Cunningham

Widder Hotel N.Y.

Business engagements such cant tell  
- you will have to take your  
chances

T. A. Edison

10<sup>th</sup> Collect

10<sup>th</sup> Jan  
9 PM

597

COMPLIMENTARY.

ELEVENTH ANNUAL FAIR

Jersey County Agricultural Board.

JERSEYVILLE, ILL.

October 15, 16, 17 & 18, 1879

ADMIT

*Mr. A. Ryan and family*

and Vehicle, during Fair.

NOT TRANSFERABLE.

MORRIS H. LOCKE, Secretary.

HENRY RYAN, President.

JOHN CO., CHICAGO.

THEO. PUSKAS  
1, Rue de la Poudre

Paris, le October 29<sup>th</sup> 1874

My dear Edison:

I have, in your name, given a  
small Phonograph to the 'nationale lottery.'  
which object was to allow poor people to  
visit the Exposition.

I received, in answer, the enclosed  
letter which I forward you.

Very truly yours

Theo. Puskas  
P<sup>th</sup>

Paris Oct 23-46

Puskas

Paris, le 24 octobre 25<sup>e</sup> 1871.

My dear Edison,

Enclosed please find Provisions of tin-foil used for the large and small Phonographs here; will you kindly order a hundred kilos of the improved foil for the big Phonographs and two hundred kilos for the small instruments.

I would beg you to have it shipped to me directly here to Paris together with the bill for this as well as the last shipment.

On account of the duty I should like to have it shipped as lead.

Very truly yours

Thos. Edison  
Am.



Lucas Oct 22 28

Ordering foil  
for Phon

sent Cook order  
new eggs are  
better good

1  
Mr Rank Nov 15 78

Geo Chapman

Care E W Serrill

76 Chambers St

To to fourteen West 22<sup>nd</sup> St

Order One Dozen Cans

Borden's Eagle Condensed

Milk. Must be fresh

W A Edison

1878

11 20<sup>th</sup> in  
g m m

No 2

Nov 18, 78.

M Gasser Hotel Guthrie  
68 or 86 Greenwich, at NY

We are supplied  
at present  
John Kneesi

Spaid

Nov 25-78

2

TBA David

Gre & Stock Tel Co  
NY

Will be in NY tomorrow  
till midnight

T.A. Edison

7:54  
7:30 pm.  
1974

My Br E.  
OK. - I got it - &  
have attended to  
the Washu matter  
Yours E. J.

W. M. 1638  
*[Signature]*  
**The Edison Speaking Phonograph Co.**  
**DAILY REPORT**  
as  
Exhibition of Phonograph No. ....

Date of Exhibition.....  
Place.....  
Name of Hall.....  
Number of Tickets Sold.....  
Number of "Dead Heads".....  
Gross Receipts.....\$.....  
Royalty at.....per cent.\$.....  
Next Exhibition will be at.....

Enclosed please find.....  
.....amount of royalty due on above exhibit.  
I certify on honor that the above is a correct  
return, and agree to make oath to a consolidated  
statement embracing each week's Exhibitions.

.....  
Manager of Phonograph No. ....  
To JAMES REDPATH, General Manager,  
203 Broadway, N. Y.

N. B.—All remittances to be made by P. O. Order, or Draft on New York.

OFFICE OF  
**A. ALEX. POOL & CO.,**  
MANUFACTURERS OF  
**PATENTED MACHINERY,**  
**Small Patented Articles in Wood or Metal,**  
SPECIAL TOOLS AND MACHINERY DESIGNED AND BUILT,  
55 & 57 N. J. R. AVENUE,

TERMS 1--A deposit required on orders for Patented Articles.  
Special Machinery or Tools must be paid for as the work progresses every week.  
References given if required.

Newark, N. J. Dec 24 1878

Dear Sir

Will you be so  
kind as loan me a Phonograph  
for a short while. I wish to show  
it to some friends and will be  
responsible for its safe return.

I would like to have it by  
Friday the 6th inst if you can  
make it convenient to let me  
have it by that time

Yours Respectfully  
A. Alex. Pool.

To  
Prof Geo A Edison  
Menlo Park  
N. J.

Newark NJ  
Dec 30 78  
A. Alip. Pool  
and Dec 30 78



LA LLUMANERA DE NOVA YORK.

*Arturo Gargallo*

P. O. BOX 1116.

New York Dec. 7/98.

Mr. S. L. Griffin  
Secretary.

Dear Sir.

I am commissioned  
to see Mr. Edison and deliver  
to him a letter from a party  
in Barcelona (Spain), and  
get his terms &c about some  
important business. Will you  
be kind enough to ask Mr.  
Edison to favor me with an  
appointment for some day next  
week - not Wednesday or Saturday  
- and time of day most  
convenient for him to receive  
my call.

Yours respectfully  
*Arturo Gargallo*

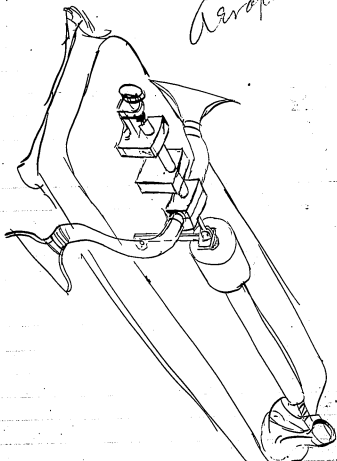
F. NY Dec 7 78

Arthur Pugh  
and Sally 78

T. A. EDISON,

Menlo Park, N. J., 187

*Aerophone*



T. A. EDISON,

Mont Park, N. J.,

187

Deare Gaston 2 Nassau St

N. Y.

I may possibly be at vector  
St. depot Metropolitan Railroad  
at nine this evening

T. A. Edison

Supt. Brocklin  
Met R.R. 7/3 Bway

Will not be over  
tonight did not get  
instrument done in time

T. A. Edison

12 DK

If not called for in 10 days, return to

T. A. EDISON,  
MENLO PARK,  
N. J.

Specification of phosphide of  
reduction of metal as  
non conductors

Dear Mr. Brown

Here are a lot of  
Cards that may interest you

The Boston firm that  
publishes them are selling  
them by the hundred  
thousand <sup>fully</sup> for Redpolls

My Dear Mr. Beebe.

I just came back from the institute  
I give you the exact description concerning  
the presentation of the Phonograph the success  
has been "great".

Mr. de Caux du Moncel  
explained the apparatus to the members of the  
Academy and then all came round.

The presentation has been done in  
the name of Mr. Edison, and then Mr.  
Diction has spoken into the instrument  
"Phonograph presents its compliments to  
the members of Academy" and when the  
apparatus repeated the sentence word by  
word "A thunder of applause" was  
heard in the room.

After the 1st experiment the apparatus  
was taken down into Mr. Dumas' private  
office accompanied by Mr. Revo, Fresca  
Rosal etc etc members of the Academy —

Mr. Fresca showed us a looking to  
try it by himself for the sake of several  
members, so Mr. Patras gave another  
Cinfold and he operated himself to his  
great satisfaction.

I beg Mr. Beebe to advise  
my sincere compliments to Mr. Edison  
and tell him that I am an admirer of  
his new accomplished invention.

Yours Truly,  
Hardy.



Harvey -

He [unclear]  
Oliver

THE LATEST SENSATION IN SCIENCE.

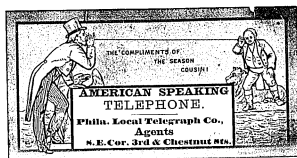
# "EVOLUTION OF SOUND."

Every professor, student, or lover of science, who wishes to keep pace with the astonishing strides of modern scientific discovery, should have a copy of the above-named work on Sound. If the telephone, phonograph and microphone were surprises to the scientific world, this revolutionary monograph must utterly astound it. The opinions of investigators of sonorous phenomena are unanimous, so far as yet learned, that the old theory of wave-motion has at last met its doom. A very careful physicist at Tiffin, Ohio, writes the author:—"I must congratulate you and the cause of scientific research upon the result of your labors on Sound. I have no hesitation in saying that your arguments and facts have shattered the wave-theory so completely as to leave no doubt in the mind of any competent investigator as to its overthrow; while a physicist can only be astonished, as his reader, that so absurd and impossible a theory as that of wave-motion could have held sway for so many years, and been endorsed by the ablest scientists of the world, without ever having been once called in question. Your book must sell and create a profound sensation wherever science is investigated or understood."

This book contains 274 pages (royal octavo), price \$1; but in view of placing it at once in the hands of all lovers of original scientific research, we have prepared a special edition for professors, teachers and students of science, which will be sent post-paid at half price, or 50 cents in postage stamps or currency.

HALL & CO., Publishers,

234 BROADWAY, NEW YORK.



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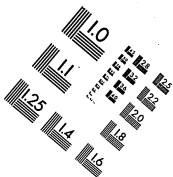
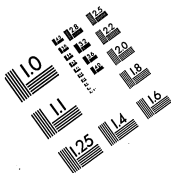
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Centimeter



Inches

